

SEQUENCE LISTING

<110> MUTABILIS

5 <120> Comprising of polypeptides specific to pathogenic strains and their use as vaccines and in immunotherapy

<130> 2209

<160> 160

<170> PatentIn version 3.1

<210> 1

10 <211> 163

<212> PRT

<213> Escherichia coli

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15 Met Lys Leu Lys Ala Ile Ile Leu Ala Thr Gly Leu Ile Asn Cys
Ile
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20 Val Phe Ser Ala Gln Ala Val Asp Thr Thr Ile Thr Val Thr Gly
Asn
20 25 30

25 Val Leu Gln Arg Thr Cys Asn Val Pro Gly Asn Val Asp Val Ser
Leu
35 40 45

30 Gly Asn Leu Tyr Val Ser Asp Phe Pro Asn Ala Gly Ser Gly Ser
Pro
50 55 60

35 Trp Val Asn Phe Asp Leu Ser Leu Thr Gly Cys Gln Asn Met Asn
Thr
65 70 75 80

40 Val Arg Ala Thr Phe Ser Gly Thr Ala Asp Gly Gln Thr Tyr Tyr
Ala
85 90 95

45 Asn Thr Gly Asn Ala Gly Gly Ile Lys Ile Glu Ile Gln Asp Arg
Asp
100 105 110

50 Gly Ser Asn Ala Ser Tyr His Asn Gly Met Phe Lys Thr Leu Asn
Val

115

120

125

5 Gln Asn Asn Asn Ala Thr Phe Asn Leu Lys Ala Arg Ala Val Ser
Lys
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10 Gly Gln Val Thr Pro Gly Asn Ile Ser Ser Val Ile Thr Val Thr
Tyr
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160

15 Thr Tyr Ala

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Leu
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30 Pro Ala Ile Ala Asn Ala Gln Thr Ser Gln Gln Asp Glu Ser Thr
Leu
20 25 30

35 Val Val Thr Ala Ser Lys Gln Ser Ser Arg Ser Ala Ser Ala Asn
Asn
35 40 45

40 Val Ser Ser Thr Val Val Ser Ala Pro Glu Leu Ser Asp Ala Gly
Val
50 55 60

45 Thr Ala Ser Asp Lys Leu Pro Arg Val Leu Pro Gly Leu Asn Ile
Glu
65 70 75 80

50 Asn Ser Gly Asn Met Leu Phe Ser Thr Ile Ser Leu Arg Gly Val
Ser

| | 85 | 90 | 95 |
|----|--------------------------------------------------------------------|---------|---------|
| 5 | Ser Ala Gln Asp Phe Tyr Asn Pro Ala Val Thr Leu Tyr Val Asp Gly | 100 | 105 110 |
| 10 | Val Pro Gln Leu Ser Thr Asn Thr Ile Gln Ala Leu Thr Asp Val Gln | 115 | 120 125 |
| 15 | Ser Val Glu Leu Leu Arg Gly Pro Gln Gly Thr Leu Tyr Gly Lys Ser | 130 | 135 140 |
| 20 | Ala Gln Gly Gly Ile Ile Asn Ile Val Thr Gln Gln Pro Asp Ser Thr | 145 150 | 155 160 |
| 25 | Pro Arg Gly Tyr Ile Glu Gly Gly Val Ser Ser Arg Asp Ser Tyr Arg | 165 | 170 175 |
| 30 | Ser Lys Phe Asn Leu Ser Gly Pro Ile Gln Asp Gly Leu Leu Tyr Gly | 180 | 185 190 |
| 35 | Ser Val Thr Leu Leu Arg Gln Val Asp Asp Gly Asp Met Ile Asn Pro | 195 | 200 205 |
| 40 | Ala Thr Gly Ser Asp Asp Leu Gly Gly Thr Arg Ala Ser Ile Gly Asn | 210 | 215 220 |
| 45 | Val Lys Leu Arg Leu Ala Pro Asp Asp Gln Pro Trp Glu Met Gly Phe | 225 230 | 235 240 |

Ala Ala Ser Arg Glu Cys Thr Arg Ala Thr Gln Asp Ala Tyr Val
 Gly
 245 250 255

5 Trp Asn Asp Ile Lys Gly Arg Lys Leu Ser Ile Ser Asp Gly Ser
 Pro
 260 265 270

10 Asp Pro Tyr Met Arg Arg Cys Thr Asp Ser Gln Thr Leu Ser Gly
 Lys
 275 280 285

15 Tyr Thr Thr Asp Asp Trp Val Phe Asn Leu Ile Ser Ala Trp Gln
 Gln
 290 295 300

20 Gln His Tyr Ser Arg Thr Phe Pro Ser Gly Ser Leu Ile Val Asn
 Met
 305 310 315
 320

25 Ser Gln Arg Trp Asn Gln Asp Val Gln Glu Leu Arg Ala Ala Thr
 Leu
 325 330 335

30 Gly Asp Ala Arg Thr Val Asp Met Val Phe Gly Leu Tyr Arg Gln
 Asn
 340 345 350

35 Thr Arg Glu Lys Leu Asn Ser Ala Tyr Asp Met Pro Thr Met Pro
 Tyr
 355 360 365

40 Leu Ser Ser Thr Gly Tyr Thr Thr Ala Glu Thr Leu Ala Ala Tyr
 Ser
 370 375 380

45 Asp Leu Thr Trp His Leu Thr Asp Arg Phe Asp Ile Gly Gly Gly
 Val
 385 390 395

50 400

10

15

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25

30

35

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45

50

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Ile Asn Gly Asn Val  Ile Arg Ser Glu Phe Thr Asn Asp Ser  Glu
Leu
545                550                555
560

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Tyr His Gly Asn Arg Val Pro Phe Val Pro Arg Tyr Gly Ala Gly
 Ser
 5 565 570 575

Ser Val Asn Gly Val Ile Asp Thr Arg Tyr Gly Ala Leu Met Pro
 Arg
 10 580 585 590

Leu Ala Val Asn Leu Val Gly Pro His Tyr Phe Asp Gly Asp Asn
 Gln
 15 595 600 605

Leu Arg Gln Gly Thr Tyr Ala Thr Leu Asp Ser Ser Leu Gly Trp
 Gln
 20 610 615 620

Ala Thr Glu Arg Met Asn Ile Ser Val Tyr Val Asp Asn Leu Phe
 Asp
 25 625 630 635
 640

Arg Arg Tyr Arg Thr Tyr Gly Tyr Met Asn Gly Ser Ser Ala Val
 Ala
 30 645 650 655

Gln Val Asn Met Gly Arg Thr Val Gly Ile Asn Thr Arg Ile Asp
 Phe
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Phe
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 Phe
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| 10 | Gly Lys Ala Gly Ala Ser Val Met Ser Leu Ser Asp Gln Arg Phe Leu | 35 | 40 | 45 |
| 15 | Ser Gly Asp Glu Glu Glu Thr Ser Lys Tyr Lys Gly Gly Asp Asp His | 50 | 55 | 60 |
| 20 | Asp Thr Val Phe Ser Gly Gly Ile Ala Val Gly Tyr Asp Phe Tyr Pro | 65 | 70 | 75 80 |
| 25 | Gln Phe Ser Ile Pro Val Arg Thr Glu Leu Glu Phe Tyr Ala Arg Gly | 85 | 90 | 95 |
| 30 | Lys Ala Asp Ser Lys Tyr Asn Val Asp Lys Asp Ser Trp Ser Gly Gly | 100 | 105 | 110 |
| 35 | Tyr Trp Arg Asp Asp Leu Lys Asn Glu Val Ser Val Asn Thr Leu Met | 115 | 120 | 125 |
| 40 | Leu Asn Ala Tyr Tyr Asp Phe Arg Asn Asp Ser Ala Phe Thr Pro Trp | 130 | 135 | 140 |
| 45 | Val Ser Ala Gly Ile Gly Tyr Ala Arg Ile His Gln Lys Thr Thr Gly | 145 | 150 | 155 |
| 50 | Ile Ser Thr Trp Asp Tyr Glu Tyr Gly Ser Ser Gly Arg Glu Ser Leu | 165 | 170 | 175 |

Ser Arg Ser Gly Ser Ala Asp Asn Phe Ala Trp Ser Leu Gly Ala
 Gly
 5 180 185 190

Val Arg Tyr Asp Val Thr Pro Asp Ile Ala Leu Asp Leu Ser Tyr
 Arg
 10 195 200 205

Tyr Leu Asp Ala Gly Asp Ser Ser Val Ser Tyr Lys Asp Glu Trp
 Gly
 15 210 215 220

Asp Lys Tyr Lys Ser Glu Val Asp Val Lys Ser His Asp Ile Met
 Leu
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Gly Met Thr Tyr Asn Phe
 25 245

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 Ile
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 Arg
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Val Leu Pro Arg Thr Cys Thr Ile Gly Asn Gly Gly Asn Pro Asn
 Ala
 45 35 40 45

Thr Val Val Leu Asp Asn Ala Tyr Thr Ser Asp Leu Ile Ala Ala
 Asn
 50 50 55 60

Ser Thr Ser Gln Trp Lys Asn Phe Ser Leu Thr Leu Thr Asn Cys
 Gln
 5 65 70 75 80

Asn Val Asn Asn Val Thr Ser Phe Gly Gly Thr Ala Glu Asn Thr
 Asn
 10 85 90 95

Tyr Tyr Arg Asn Thr Gly Asp Ala Thr Asn Ile Met Val Glu Leu
 Gln
 15 100 105 110

Glu Gln Gly Asn Gly Asn Thr Pro Leu Lys Val Gly Ser Thr Lys
 Val
 20 115 120 125

Val Thr Val Ser Asn Gly Gln Ala Thr Phe Asn Leu Lys Val Arg
 Ala
 25 130 135 140

Val Ser Lys Gly Asn Ala Gly Ala Gly Ser Ile Asn Ser Gln Ile
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 30 145 150 155
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Val Thr Tyr Thr Tyr Ala
 35 165

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Met Asn Lys Ile Tyr Ser Leu Lys Tyr Ser Ala Ala Thr Gly Gly
 Leu
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Ile Ala Val Ser Glu Leu Ala Lys Arg Val Ser Gly Lys Thr Asn
 Arg
 50 20 25 30

| | | | | |
|----|--------------------------------------------------------------------|-----|-----|-------|
| 5 | Lys Leu Val Ala Thr Met Leu Ser Leu Ala Val Ala Gly Thr Val Asn | 35 | 40 | 45 |
| 10 | Ala Ala Asn Ile Asp Ile Ser Asn Val Trp Ala Arg Asp Tyr Leu Asp | 50 | 55 | 60 |
| 15 | Leu Ala Gln Asn Lys Gly Ile Phe Gln Pro Gly Ala Thr Asp Val Thr | 65 | 70 | 75 80 |
| 20 | Ile Thr Leu Lys Asn Gly Asp Lys Phe Ser Phe His Asn Leu Ser Ile | 85 | 90 | 95 |
| 25 | Pro Asp Phe Ser Gly Ala Ala Ala Ser Gly Ala Ala Thr Ala Ile Gly | 100 | 105 | 110 |
| 30 | Gly Ser Tyr Ser Val Thr Val Ala His Asn Lys Lys Asn Pro Gln Ala | 115 | 120 | 125 |
| 35 | Ala Glu Thr Gln Val Tyr Ala Gln Ser Ser Tyr Arg Val Val Asp Arg | 130 | 135 | 140 |
| 40 | Arg Asn Ser Asn Asp Phe Glu Ile Gln Arg Leu Asn Lys Phe Val Val | 145 | 150 | 155 |
| | | 160 | | |
| 45 | Glu Thr Val Gly Ala Thr Pro Ala Glu Thr Asn Pro Thr Thr Tyr Ser | 165 | 170 | 175 |
| 50 | Asp Ala Leu Glu Arg Tyr Gly Ile Val Thr Ser Asp Gly Ser Lys Lys | 180 | 185 | 190 |

| | | | | |
|----|--------------------------------------------------------------------|-----|-----|-----|
| 5 | Ile Ile Gly Phe Arg Ala Gly Ser Gly Gly Thr Ser Phe Ile Asn Gly | 195 | 200 | 205 |
| 10 | Glu Ser Lys Ile Ser Thr Asn Ser Ala Tyr Ser His Asp Leu Leu Ser | 210 | 215 | 220 |
| 15 | Ala Ser Leu Phe Glu Val Thr Gln Trp Asp Ser Tyr Gly Met Met Ile | 225 | 230 | 235 |
| | 240 | | | |
| 20 | Tyr Lys Asn Asp Lys Thr Phe Arg Asn Leu Glu Ile Phe Gly Asp Ser | 245 | 250 | 255 |
| 25 | Gly Ser Gly Ala Tyr Leu Tyr Asp Asn Lys Leu Glu Lys Trp Val Leu | 260 | 265 | 270 |
| 30 | Val Gly Thr Thr His Gly Ile Ala Ser Val Asn Gly Asp Gln Leu Thr | 275 | 280 | 285 |
| 35 | Trp Ile Thr Lys Tyr Asn Asp Lys Leu Val Ser Glu Leu Lys Asp Thr | 290 | 295 | 300 |
| 40 | Tyr Ser His Lys Ile Asn Leu Asn Gly Asn Asn Val Thr Ile Lys Asn | 305 | 310 | 315 |
| | 320 | | | |
| 45 | Thr Asp Ile Thr Leu His Gln Asn Asn Ala Asp Thr Thr Gly Thr Gln | 325 | 330 | 335 |
| 50 | Glu Lys Ile Thr Lys Asp Lys Asp Ile Val Phe Thr Asn Gly Gly Asp | | | |

| | | | | | |
|----|--------------------------------------------------------------------|-----|-----|-----|-----|
| | 340 | | 345 | | 350 |
| 5 | Val Leu Phe Lys Asp Asn Leu Asp Phe Gly Ser Gly Gly Ile Ile Phe | 355 | 360 | 365 | |
| 10 | Asp Glu Gly His Glu Tyr Asn Ile Asn Gly Gln Gly Phe Thr Phe Lys | 370 | 375 | 380 | |
| 15 | Gly Ala Gly Ile Asp Ile Gly Lys Glu Ser Ile Val Asn Trp Asn Ala | 385 | 390 | 395 | |
| | 400 | | | | |
| 20 | Leu Tyr Ser Ser Asp Asp Val Leu His Lys Ile Gly Pro Gly Thr Leu | 405 | 410 | 415 | |
| 25 | Asn Val Gln Lys Lys Gln Gly Ala Asn Ile Lys Ile Gly Glu Gly Asn | 420 | 425 | 430 | |
| 30 | Val Ile Leu Asn Glu Glu Gly Thr Phe Asn Asn Ile Tyr Leu Ala Ser | 435 | 440 | 445 | |
| 35 | Gly Asn Gly Lys Val Ile Leu Asn Lys Asp Asn Ser Leu Gly Asn Asp | 450 | 455 | 460 | |
| 40 | Gln Tyr Ala Gly Ile Phe Phe Thr Lys Arg Gly Gly Thr Leu Asp Leu | 465 | 470 | 475 | |
| | 480 | | | | |
| 45 | Asn Gly His Asn Gln Thr Phe Thr Arg Ile Ala Ala Thr Asp Asp Gly | 485 | 490 | 495 | |
| 50 | | | | | |

| | | | | | | | | | | | | | | | |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | Thr | Thr | Ile | Thr | Asn | Ser | Asp | Thr | Thr | Lys | Glu | Ala | Val | Leu | Ala |
| | Ile | | | | | | | | | | | | | | |
| | | | | 500 | | | | | 505 | | | | | 510 | |
| 5 | Asn | Asn | Glu | Asp | Ser | Tyr | Ile | Tyr | His | Gly | Asn | Ile | Asn | Gly | Asn |
| | Ile | | | | | | | | | | | | | | |
| | | | 515 | | | | | 520 | | | | | 525 | | |
| 10 | Lys | Leu | Thr | His | Asn | Ile | Asn | Ser | Gln | Asp | Lys | Lys | Thr | Asn | Ala |
| | Lys | | | | | | | | | | | | | | |
| | | 530 | | | | | | 535 | | | | | 540 | | |
| 15 | Leu | Ile | Leu | Asp | Gly | Ser | Val | Asn | Thr | Lys | Asn | Asp | Val | Glu | Val |
| | Ser | | | | | | | | | | | | | | |
| | 545 | | | | | 550 | | | | | 555 | | | | |
| | 560 | | | | | | | | | | | | | | |
| 20 | Asn | Ala | Ser | Leu | Thr | Met | Gln | Gly | His | Ala | Thr | Glu | His | Ala | Ile |
| | Phe | | | | | | | | | | | | | | |
| | | | | 565 | | | | | | 570 | | | | 575 | |
| 25 | Arg | Ser | Ser | Ala | Asn | His | Cys | Ser | Leu | Val | Phe | Leu | Cys | Gly | Thr |
| | Asp | | | | | | | | | | | | | | |
| | | | | 580 | | | | | 585 | | | | | 590 | |
| 30 | Trp | Val | Thr | Val | Leu | Lys | Glu | Thr | Glu | Ser | Ser | Tyr | Asn | Lys | Lys |
| | Phe | | | | | | | | | | | | | | |
| | | | 595 | | | | | 600 | | | | | 605 | | |
| 35 | Asn | Ser | Asp | Tyr | Lys | Ser | Asn | Asn | Gln | Gln | Thr | Ser | Phe | Asp | Gln |
| | Pro | | | | | | | | | | | | | | |
| | | 610 | | | | | 615 | | | | | 620 | | | |
| 40 | Asp | Trp | Lys | Thr | Gly | Val | Phe | Lys | Phe | Asp | Thr | Leu | His | Leu | Asn |
| | Asn | | | | | | | | | | | | | | |
| | 625 | | | | | 630 | | | | | 635 | | | | |
| 45 | 640 | | | | | | | | | | | | | | |
| 50 | Ala | Asp | Phe | Ser | Ile | Ser | Arg | Asn | Ala | Asn | Val | Glu | Gly | Asn | Ile |
| | Ser | | | | | | | | | | | | | | |
| | | | | 645 | | | | | | 650 | | | | 655 | |

| | | | |
|--------------------------------------------------------------------|-----|-----|-----|
| Ala Asn Lys Ser Ala Ile Thr Ile Gly Asp Lys Asn Val Tyr Ile Asp | 660 | 665 | 670 |
| 5 | | | |
| Asn Leu Ala Gly Lys Asn Ile Thr Asn Asn Gly Phe Asp Phe Lys Gln | 675 | 680 | 685 |
| 10 | | | |
| Thr Ile Ser Thr Asn Leu Ser Ile Gly Glu Thr Lys Phe Thr Gly Gly | 690 | 695 | 700 |
| 15 | | | |
| Ile Thr Ala His Asn Ser Gln Ile Ala Ile Gly Asp Gln Ala Val Val | 705 | 710 | 715 |
| 20 | 720 | | |
| Thr Leu Asn Gly Ala Thr Phe Leu Asp Asn Thr Pro Ile Ser Ile Asp | 725 | 730 | 735 |
| 25 | | | |
| Lys Gly Ala Lys Val Ile Ala Gln Asn Ser Met Phe Thr Thr Lys Gly | 740 | 745 | 750 |
| 30 | | | |
| Ile Asp Ile Ser Gly Glu Leu Thr Met Met Gly Ile Pro Glu Gln Asn | 755 | 760 | 765 |
| 35 | | | |
| Ser Lys Thr Val Thr Pro Gly Leu His Tyr Ala Ala Asp Gly Phe Arg | 770 | 775 | 780 |
| 40 | | | |
| Leu Ser Gly Gly Asn Ala Asn Phe Ile Ala Arg Asn Met Ala Ser Val | 785 | 790 | 795 |
| 45 | 800 | | |
| Thr Gly Asn Ile Tyr Ala Asp Asp Ala Ala Thr Ile Thr Leu Gly Gln | 805 | 810 | 815 |
| 50 | | | |

| | | | | |
|----|--------------------------------------------------------------------|-----|-----|-----|
| 5 | Pro Glu Thr Glu Thr Pro Thr Ile Ser Ser Ala Tyr Gln Ala Trp Ala | 820 | 825 | 830 |
| 10 | Glu Thr Leu Leu Tyr Gly Phe Asp Thr Ala Tyr Arg Gly Ala Ile Thr | 835 | 840 | 845 |
| 15 | Ala Pro Lys Ala Thr Val Ser Met Asn Asn Ala Ile Trp His Leu Asn | 850 | 855 | 860 |
| 20 | Ser Gln Ser Ser Ile Asn Arg Leu Glu Thr Lys Asp Ser Met Val Arg | 865 | 870 | 875 |
| | | | | 880 |
| 25 | Phe Thr Gly Asp Asn Gly Lys Phe Thr Thr Leu Thr Val Asn Asn Leu | 885 | 890 | 895 |
| 30 | Thr Ile Asp Asp Ser Ala Phe Val Leu Arg Ala Asn Leu Ala Gln Ala | 900 | 905 | 910 |
| 35 | Asp Gln Leu Val Val Asn Lys Ser Leu Ser Gly Lys Asn Asn Leu Leu | 915 | 920 | 925 |
| 40 | Leu Val Asp Phe Ile Glu Lys Asn Gly Asn Ser Asn Gly Leu Asn Ile | 930 | 935 | 940 |
| 45 | Asp Leu Val Ser Ala Pro Lys Gly Thr Ala Val Asp Val Phe Lys Ala | 945 | 950 | 955 |
| | | | | 960 |
| 50 | Thr Thr Arg Ser Ile Gly Phe Ser Asp Val Thr Pro Val Ile Glu Gln | | | |

965

970

975

| | | | | | | | | | | | | | | | | |
|----|------------|------|-----|-----|-----|-----|------|------|-----|-----|-----|------|------|-----|-----|--|
| 5 | Lys Ser | Asn | Asp | Thr | Asp | Lys | Ala | Thr | Trp | Thr | Leu | Ile | Gly | Tyr | Lys | |
| | | | 980 | | | | | 985 | | | | | 990 | | | |
| 10 | Val Gly | Ala | Asn | Ala | Asp | Ala | Ala | Lys | Lys | Ala | Thr | Leu | Leu | Met | Ser | |
| | | | 995 | | | | | 1000 | | | | | 1005 | | | |
| 15 | Gly | Tyr | Lys | Ala | Phe | Leu | Ala | Glu | Val | Asn | Asn | Leu | Asn | Lys | Arg | |
| | | 1010 | | | | | 1015 | | | | | 1020 | | | | |
| 20 | Met | Gly | Asp | Leu | Arg | Asp | Ile | Asn | Gly | Glu | Ser | Gly | Ala | Trp | Ala | |
| | | 1025 | | | | | 1030 | | | | | 1035 | | | | |
| 25 | Arg | Ile | Ile | Ser | Gly | Thr | Gly | Ser | Ala | Gly | Gly | Gly | Phe | Ser | Asp | |
| | | 1040 | | | | | 1045 | | | | | 1050 | | | | |
| 30 | Asn | Tyr | Thr | His | Val | Gln | Val | Gly | Ala | Asp | Asn | Lys | His | Glu | Leu | |
| | | 1055 | | | | | 1060 | | | | | 1065 | | | | |
| 35 | Asp | Gly | Leu | Asp | Leu | Phe | Thr | Gly | Val | Thr | Met | Thr | Tyr | Thr | Asp | |
| | | 1070 | | | | | 1075 | | | | | 1080 | | | | |
| 40 | Ser | His | Ala | Gly | Ser | Asp | Ala | Phe | Ser | Gly | Glu | Thr | Lys | Ser | Val | |
| | | 1085 | | | | | 1090 | | | | | 1095 | | | | |
| 45 | Gly | Ala | Gly | Leu | Tyr | Ala | Ser | Ala | Met | Phe | Glu | Ser | Gly | Ala | Tyr | |
| | | 1100 | | | | | 1105 | | | | | 1110 | | | | |
| 50 | Ile | Asp | Leu | Ile | Gly | Lys | Tyr | Val | His | His | Asp | Asn | Glu | Tyr | Thr | |
| | | 1115 | | | | | 1120 | | | | | 1125 | | | | |
| 55 | Ala | Thr | Phe | Ala | Gly | Leu | Gly | Thr | Arg | Asp | Tyr | Ser | Ser | His | Ser | |
| | | 1130 | | | | | 1135 | | | | | 1140 | | | | |
| 60 | Trp | Tyr | Ala | Gly | Ala | Glu | Val | Gly | Tyr | Arg | Tyr | His | Val | Thr | Asp | |
| | | 1145 | | | | | 1150 | | | | | 1155 | | | | |

5 Ser Ala Trp Ile Glu Pro Gln Ala Glu Leu Val Tyr Gly Ala Val
 1160 1165 1170
 10 Ser Gly Lys Gln Phe Ser Trp Lys Asp Gln Gly Met Asn Leu Thr
 1175 1180 1185
 15 Met Lys Asp Lys Asp Phe Asn Pro Leu Ile Gly Arg Thr Gly Val
 1190 1195 1200
 20 Arg Ala Gly Leu Gly Tyr Gln Phe Asp Leu Phe Ala Asn Gly Glu
 1220 1225 1230
 25 Thr Val Leu Arg Asp Ala Ser Gly Glu Lys Arg Ile Lys Gly Glu
 1235 1240 1245
 30 Lys Asp Gly Arg Met Leu Met Asn Val Gly Leu Asn Ala Glu Ile
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Pro Arg Ala His Asn Thr Thr Gly Leu Leu Pro Val Arg Glu Ile
 Cys
 10 35 40 45

Phe Pro His His Gly Asp Asp Gly Arg Asn Ser Ile Glu Pro Ser
 Ile
 15 50 55 60

Ser Arg Ala Ala His Thr Asp Arg Leu Arg Phe Val Cys Met Thr
 Arg
 20 65 70 75 80

Thr Gly Ser Thr Thr Ser Arg Pro Phe Cys Pro Ile Pro Arg Ser
 Pro
 25 85 90 95

Ala Leu Asn Ala Ser Gly Gln Gln Asp Ser Gly Phe Trp Gly Val
 Ser
 30 100 105 110

Ser Ile Pro Gly Asp Ile Leu Met Phe Gln Leu His Val Leu Ile
 Val
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Phe Ile Cys Lys Ile Asn Leu Ser Asp Asn Asn Ile Ser Tyr
 130 135 140
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 45 <213> Escherichia coli
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Phe His Leu Ser Cys Leu Thr Leu Ile Cys Ser Ala Gln Val Tyr
 Ala
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 5

Lys Pro Asp Met Arg Pro Leu Gly Pro Asn Ile Ala Asp Lys Gly
 Ser
 35 40 45
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Val Phe Tyr His Phe Ser Ala Thr Ser Phe Asp Ser Val Asp Gly
 Thr
 50 55 60
 15

Arg His Tyr Arg Val Trp Thr Ala Val Pro Asn Thr Thr Ala Pro
 Ala
 65 70 75 80
 20

Ser Gly Tyr Pro Ile Leu Tyr Met Leu Asp Gly Asn Ala Val Met
 Asp
 85 90 95
 25

Arg Leu Asp Asp Glu Leu Leu Lys Gln Leu Ser Glu Lys Thr Pro
 Pro
 100 105 110
 30

Val Ile Val Ala Val Gly Tyr Gln Thr Asn Leu Pro Phe Asp Leu
 Asn
 115 120 125
 35

Ser Arg Ala Tyr Asp Tyr Thr Pro Ala Ala Glu Ser Arg Lys Thr
 Asp
 130 135 140
 40

Leu His Ser Gly Arg Phe Ser Arg Lys Ser Gly Gly Ser Asn Asn
 Phe
 145 150 155
 45

Arg Gln Leu Leu Glu Thr Arg Ile Ala Pro Lys Val Glu Gln Gly
 Leu
 165 170 175
 50

[illegible]

Met Arg Ile Asn Lys Ile Leu Trp Ser Leu Thr Val Leu Leu Val
 Gly
 1 5 10 15
 5
 Leu Asn Ser Gln Val Ser Val Ala Lys Tyr Ser Asp Asp Asp Asn
 Asp
 20 25 30
 10
 Glu Thr Leu Val Val Glu Ala Thr Ala Glu Gln Val Leu Lys Gln
 Gln
 35 40 45
 15
 Pro Gly Val Ser Val Ile Thr Ser Glu Asp Ile Lys Lys Thr Pro
 Pro
 50 55 60
 20
 Val Asn Asp Leu Ser Asp Ile Ile Arg Lys Met Pro Gly Val Asn
 Leu
 65 70 75 80
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 Thr Gly Asn Ser Ala Ser Gly Thr Arg Gly Asn Asn Arg Gln Ile
 Asp
 85 90 95
 30
 Ile Arg Gly Met Gly Pro Glu Asn Thr Leu Ile Leu Ile Asp Gly
 Val
 100 105 110
 35
 Pro Val Thr Ser Arg Asn Ser Val Arg Tyr Ser Trp Arg Gly Glu
 Arg
 115 120 125
 40
 Asp Thr Arg Gly Asp Thr Asn Trp Val Pro Pro Glu Gln Val Glu
 Arg
 130 135 140
 45
 Ile Glu Val Ile Arg Gly Pro Ala Ala Ala Arg Tyr Gly Ser Gly
 Ala
 145 150 155
 50 160

| | | | |
|----|-------------------------------------------------------------|-----|---------|
| | Ala Gly Gly Val Val Asn Ile Ile Thr Lys Arg Pro Thr Asn Asp | | |
| | Trp | | |
| | | 165 | 170 175 |
| 5 | | | |
| | His Gly Ser Leu Ser Leu Tyr Thr Asn Gln Pro Glu Ser Ser Glu | | |
| | Glu | | |
| | | 180 | 185 190 |
| 10 | | | |
| | Gly Ala Thr Arg Arg Ala Asn Phe Ser Leu Ser Gly Pro Leu Ala | | |
| | Gly | | |
| | | 195 | 200 205 |
| 15 | | | |
| | Asp Ala Leu Thr Thr Arg Leu Tyr Gly Asn Leu Asn Lys Thr Asp | | |
| | Ala | | |
| | | 210 | 215 220 |
| 20 | | | |
| | Asp Ser Trp Asp Ile Asn Ser Pro Val Gly Thr Lys Asn Ala Ala | | |
| | Gly | | |
| | | 225 | 230 235 |
| 25 | | 240 | |
| | | | |
| | His Glu Gly Val Arg Asn Lys Asp Ile Asn Gly Val Val Ser Trp | | |
| | Lys | | |
| | | 245 | 250 255 |
| 30 | | | |
| | Leu Asn Pro Gln Gln Ile Leu Asp Phe Glu Val Gly Tyr Ser Arg | | |
| | Gln | | |
| | | 260 | 265 270 |
| 35 | | | |
| | Gly Asn Ile Tyr Ala Gly Asp Thr Gln Asn Ser Ser Ser Ser Ala | | |
| | Val | | |
| | | 275 | 280 285 |
| 40 | | | |
| | Thr Glu Ser Leu Ala Lys Ser Gly Lys Glu Thr Asn Arg Leu Tyr | | |
| | Arg | | |
| | | 290 | 295 300 |
| 45 | | | |
| | Gln Asn Tyr Gly Ile Thr His Asn Gly Ile Trp Asp Trp Gly Gln | | |
| | Ser | | |
| | | 305 | 310 315 |
| 50 | | 320 | |

| | | | | |
|----|--------------------------------------------------------------------|------------|-----|-----|
| 5 | Arg Phe Gly Val Tyr Tyr Glu Lys Thr Asn Asn Thr Arg Met Asn Glu | 325 | 330 | 335 |
| 10 | Gly Leu Ser Gly Gly Gly Glu Gly Arg Ile Leu Ala Gly Glu Lys Phe | 340 | 345 | 350 |
| 15 | Thr Thr Asn Arg Leu Ser Ser Trp Arg Thr Ser Gly Glu Leu Asn Ile | 355 | 360 | 365 |
| 20 | Pro Leu Asn Val Met Val Asp Gln Thr Leu Thr Val Gly Ala Glu Trp | 370 | 375 | 380 |
| 25 | Asn Arg Asp Lys Leu Asp Asp Pro Ser Ser Thr Ser Leu Thr Val Asn | 385 400 | 390 | 395 |
| 30 | Asp Arg Asp Ile Ser Gly Ile Ser Gly Ser Ala Ala Asp Arg Ser Ser | 405 | 410 | 415 |
| 35 | Lys Asn His Ser Gln Ile Ser Ala Leu Tyr Ile Glu Asp Asn Ile Glu | 420 | 425 | 430 |
| 40 | Pro Val Pro Gly Thr Asn Ile Ile Pro Gly Leu Arg Phe Asp Tyr Leu | 435 | 440 | 445 |
| 45 | Ser Asp Ser Gly Gly Asn Phe Ser Pro Ser Leu Asn Leu Ser Gln Glu | 450 | 455 | 460 |
| 50 | Leu Gly Asp Tyr Phe Lys Val Lys Ala Gly Val Ala Arg Thr Phe Lys | | | |

| | | | | |
|-----|--------------------------------------------------------------------|-----|-----|-----|
| 465 | | 470 | | 475 |
| 480 | | | | |
| 5 | Ala Pro Asn Leu Tyr Gln Ser Ser Glu Gly Tyr Leu Leu Tyr Ser Lys | 485 | 490 | 495 |
| 10 | Gly Asn Gly Cys Pro Lys Asp Ile Thr Ser Gly Gly Cys Tyr Leu Ile | 500 | 505 | 510 |
| 15 | Gly Asn Lys Asp Leu Asp Pro Glu Ile Ser Val Asn Lys Glu Ile Gly | 515 | 520 | 525 |
| 20 | Leu Glu Phe Thr Trp Glu Asp Tyr His Ala Ser Val Thr Tyr Phe Arg | 530 | 535 | 540 |
| 25 | Asn Asp Tyr Gln Asn Lys Ile Val Ala Gly Asp Asn Val Ile Gly Gln | 545 | 550 | 555 |
| | 560 | | | |
| 30 | Thr Ala Ser Gly Ala Tyr Ile Leu Lys Trp Gln Asn Gly Gly Lys Ala | 565 | 570 | 575 |
| 35 | Leu Val Asp Gly Ile Glu Ala Ser Met Ser Phe Pro Leu Val Lys Glu | 580 | 585 | 590 |
| 40 | Arg Leu Asn Trp Asn Thr Asn Ala Thr Trp Met Ile Thr Ser Glu Gln | 595 | 600 | 605 |
| 45 | Lys Asp Thr Gly Asn Pro Leu Ser Val Ile Pro Lys Tyr Thr Ile Asn | 610 | 615 | 620 |

25/370

Asn Ser Leu Asn Trp Thr Ile Thr Gln Ala Phe Ser Ala Ser Phe
 Asn
 625 630 635
 640
 5

Trp Thr Leu Tyr Gly Arg Gln Lys Pro Arg Thr His Ala Glu Thr
 Arg
 645 650 655
 10

Ser Glu Asp Thr Gly Gly Leu Ser Gly Lys Glu Leu Gly Ala Tyr
 Ser
 660 665 670
 15

Leu Val Gly Thr Asn Phe Asn Tyr Asp Ile Asn Lys Asn Leu Arg
 Leu
 675 680 685
 20

Asn Val Gly Val Ser Asn Ile Leu Asn Lys Gln Ile Phe Arg Ser
 Ser
 690 695 700
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Glu Gly Ala Asn Thr Tyr Asn Glu Pro Gly Arg Ala Tyr Tyr Ala
 Gly
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 30 720

Val Thr Ala Ser Phe
 725
 35

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 Leu
 45 1 5 10 15

Val Ser Asn Phe Pro Ser Pro Glu Arg Val Val Ser Asp Tyr Ile
 Lys
 50 20 25 30

| | | | |
|--------------------------------------------------------------------|-----|-----|-------|
| Asn Cys Phe Lys Thr Asp Leu Pro Trp Phe Ser Arg Ile Asp Pro Asp | 35 | 40 | 45 |
| 5 | | | |
| Asn Ala Tyr Phe Ile Cys Phe Ser Gln Asn Arg Ser Asn Ser Arg Ser | 50 | 55 | 60 |
| 10 | | | |
| Tyr Thr Gly Trp Asp His Leu Gly Lys Tyr Lys Thr Glu Val Leu Thr | 65 | 70 | 75 80 |
| 15 | | | |
| Leu Thr Gln Ala Ala Leu Ile Asn Ile Gly Tyr Arg Phe Asp Val Phe | 85 | 90 | 95 |
| 20 | | | |
| Asp Asp Ala Asn Ser Ser Thr Gly Ile Tyr Lys Thr Lys Ser Ala Asp | 100 | 105 | 110 |
| 25 | | | |
| Val Phe Asn Glu Glu Asn Glu Glu Lys Met Leu Pro Ser Glu Tyr Leu | 115 | 120 | 125 |
| 30 | | | |
| His Phe Leu Gln Lys Cys Asp Phe Ala Gly Val Tyr Gly Lys Thr Leu | 130 | 135 | 140 |
| 35 | | | |
| Ser Asp Tyr Trp Ser Lys Tyr Tyr Asp Lys Phe Lys Leu Leu Leu Lys | 145 | 150 | 155 |
| 40 | | | |
| Asn Tyr Tyr Ile Ser Ser Ala Leu Tyr Leu Tyr Lys Asn Gly Glu Leu | 165 | 170 | 175 |
| 45 | | | |
| Asp Glu Arg Glu Tyr Asn Phe Ser Met Asn Ala Leu Asn Arg Ser Asp | 180 | 185 | 190 |
| 50 | | | |

| | | | | | | | | | | | | | | | |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | Asn | Ile | Ser | Leu | Leu | Phe | Phe | Asp | Ile | Tyr | Gly | Tyr | Tyr | Ala | Ser |
| | Asp | | | | | | | | | | | | | | |
| 5 | | | | 195 | | | | 200 | | | | | 205 | | |
| | Ile | Phe | Val | Ala | Lys | Asn | Asn | Asp | Lys | Val | Met | Leu | Phe | Ile | Pro |
| | Gly | | | | | | | | | | | | | | |
| 10 | | | | 210 | | | | 215 | | | | | 220 | | |
| | Ala | Lys | Lys | Pro | Phe | Leu | Phe | Lys | Lys | Asn | Ile | Ala | Asp | Leu | Arg |
| | Leu | | | | | | | | | | | | | | |
| 15 | 225 | | | | | 230 | | | | | | 235 | | | |
| | 240 | | | | | | | | | | | | | | |
| | Thr | Leu | Lys | Glu | Leu | Ile | Lys | Asp | Ser | Asp | Asn | Lys | Gln | Leu | Leu |
| | Ser | | | | | | | | | | | | | | |
| 20 | | | | | 245 | | | | | 250 | | | | | 255 |
| | Gln | His | Phe | Ser | Leu | Tyr | Ser | Arg | Gln | Asp | Gly | Val | Ser | Tyr | Ala |
| | Gly | | | | | | | | | | | | | | |
| 25 | | | | 260 | | | | | 265 | | | | | 270 | |
| | Val | Asn | Ser | Val | Leu | His | Ala | Ile | Glu | Asn | Asp | Gly | Asn | Phe | Asn |
| | Glu | | | | | | | | | | | | | | |
| 30 | | | 275 | | | | | 280 | | | | | 285 | | |
| | Ser | Tyr | Phe | Leu | Tyr | Ser | Asn | Lys | Thr | Leu | Ser | Asn | Lys | Asp | Val |
| | Phe | | | | | | | | | | | | | | |
| 35 | | 290 | | | | | 295 | | | | | 300 | | | |
| | Asp | Ala | Ile | Ala | Ile | Ser | Val | Lys | Lys | Arg | Ser | Phe | Ser | Asp | Gly |
| | Asp | | | | | | | | | | | | | | |
| 40 | 305 | | | | | 310 | | | | | 315 | | | | |
| | 320 | | | | | | | | | | | | | | |
| | Ile | Val | Ile | Lys | Ser | Asn | Ser | Glu | Ala | Gln | Arg | Asp | Tyr | Ala | Leu |
| | Thr | | | | | | | | | | | | | | |
| 45 | | | | | 325 | | | | | 330 | | | | | 335 |
| | Ile | Leu | Gln | Thr | Ile | Leu | Ser | Met | Thr | Pro | Ile | Phe | Asp | Ile | Val |
| | Val | | | | | | | | | | | | | | |
| 50 | | | | 340 | | | | | 345 | | | | | 350 | |

| | | | | | | | | | |
|----|---------|---------|---------|---------|---------|---------|---------|---------|--|
| 5 | Pro Met | Glu Val | Ser Val | Pro Leu | Gly Leu | Gly Ile | Ile Thr | Ser Ser | |
| | | 355 | | | 360 | | | 365 | |
| 10 | Gly Arg | Ile Ser | Phe Asp | Gln Leu | Ile Asn | Gly Asp | Thr Tyr | Glu Glu | |
| | | 370 | | | 375 | | | 380 | |
| 15 | Arg Leu | Ser Ala | Ile Pro | Gly Leu | Ala Thr | Asn Ala | Val Leu | Leu Gly | |
| | 385 | | | 390 | | | | 395 | |
| | 400 | | | | | | | | |
| 20 | Ser Glu | Phe Ala | Ile Pro | Leu Leu | Ile Ser | Lys Ala | Gly Ile | Asn Gln | |
| | | | | 405 | | 410 | | 415 | |
| 25 | Val Thr | Leu Ser | Ser Val | Ile Asn | Asn Glu | Gly Arg | Thr Leu | Asn Glu | |
| | | | | 420 | | 425 | | 430 | |
| 30 | Asn Ile | Asp Ile | Phe Leu | Lys Glu | Tyr Gly | Ile Ala | Glu Asp | Ser | |
| | | 435 | | | 440 | | | 445 | |
| 35 | Ser His | Ser Thr | Asn Leu | Leu Asp | Val Lys | Leu Lys | Ser Ser | Gly Gln | |
| | | 450 | | | 455 | | | 460 | |
| 40 | Val Val | Asn Ile | Val Lys | Leu Ser | Asp Glu | Asp Asn | Gln Ile | Val Ala | |
| | 465 | | | | 470 | | | 475 | |
| | 480 | | | | | | | | |
| 45 | Lys Thr | Gly Ser | Ser Leu | Ser Gly | Ile Tyr | Tyr Glu | Val Asp | Ile Glu | |
| | | | | 485 | | 490 | | 495 | |
| 50 | Gly Asn | Tyr Glu | Ile Leu | Ser Arg | Arg Ile | Tyr Arg | Thr Glu | Tyr Asn | |

| | | | |
|----|----------------------------------------------------|---------------------|-----------------|
| | 500 | 505 | 510 |
| 5 | Glu Ile Leu Trp Thr Arg Gly Gly Gly Leu Lys Phe | Gly Gly Gly Leu Lys | Gly Gly Gln Pro |
| | 515 | 520 | 525 |
| 10 | Asp Phe Glu Ser Leu Asn Ile Pro Val Phe Phe Tyr | Lys Asp Glu Pro | |
| | 530 | 535 | 540 |
| 15 | Ser Ala Val Thr Gly Ser Pro Leu Ser Phe Ile Ser | Asn Asp Asp Ser | |
| | 545 | 550 | 555 |
| | 560 | | |
| 20 | Leu Leu Tyr Pro Asp Thr Asn Pro Lys Leu Pro Glu | Gln Pro Thr Ser | |
| | 565 | 570 | 575 |
| 25 | Met Asp Ile Val Asn Tyr Val Lys Gly Ser Gly Arg | Ser Phe Gly Asp | |
| | 580 | 585 | 590 |
| 30 | Phe Val Thr Leu Met Arg Gly Ala Thr Glu Glu Ile | Glu Ala Trp Asn | |
| | 595 | 600 | 605 |
| 35 | Ala Ser Tyr His Thr Ala Gly Gly Ser Thr Glu Ile | Glu Leu His Glu | |
| | 610 | 615 | 620 |
| 40 | Leu Leu Gly Gln Gly Pro Gln Ser Ser Leu Gly Thr | Phe Thr Glu Tyr | |
| | 625 | 630 | 635 |
| | 640 | | |
| 45 | Ser Asn Val Asn Ser Ala Asp Ala Ala Ser Arg Val | Arg His Phe Leu | |
| | 645 | 650 | 655 |
| 50 | | | |

Val Ile Lys Val His Val Lys Tyr Ile Thr Asn Asn Asn Val Ser
 Tyr
 660 665 670

5 Val Asn His Trp Ala Ile Pro Asp Glu Ala Pro Val Glu Val Leu
 Ala
 675 680 685

10 Val Val Asp Arg Arg Phe Asn Phe Pro Glu Pro Ser Thr Pro Pro
 Asp
 690 695 700

15 Ile Ser Thr Ile Arg Lys Leu Leu Ser Leu Arg Tyr Phe Lys Glu
 Ser
 705 710 715
 720

20 Ile Glu Ser Thr Ser Lys Ser Asn Phe Gln Lys Leu Ser Arg Gly
 Asn
 725 730 735

25 Ile Asp Val Leu Lys Gly Arg Gly Ser Ile Ser Ser Thr Arg Gln
 Arg
 740 745 750

30 Ala Ile Tyr Pro Tyr Phe Glu Ala Ala Asn Ala Asp Glu Gln Gln
 Pro
 755 760 765

35 Leu Phe Phe Tyr Ile Lys Lys Asp Arg Phe Asp Asn His Gly Tyr
 Asp
 770 775 780

40 Gln Tyr Phe Tyr Asp Asn Thr Val Gly Leu Asn Gly Ile Pro Thr
 Leu
 785 790 795
 800

45 Asn Thr Tyr Thr Gly Glu Ile Pro Ser Asp Ser Ser Ser Leu Gly
 Ser
 805 810 815

| | | | | | | | | | | | | | | | | |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| | Thr | Tyr | Trp | Lys | Lys | Tyr | Asn | Leu | Thr | Asn | Glu | Thr | Ser | Ile | Ile | |
| | Arg | | | | | | | | | | | | | | | |
| | | | | 820 | | | | | 825 | | | | | 830 | | |
| 5 | | | | | | | | | | | | | | | | |
| | Val | Ser | Asn | Ser | Ala | Arg | Gly | Ala | Asn | Gly | Ile | Lys | Ile | Ala | Leu | |
| | Glu | | | | | | | | | | | | | | | |
| | | | 835 | | | | | 840 | | | | | 845 | | | |
| 10 | | | | | | | | | | | | | | | | |
| | Glu | Val | Gln | Glu | Gly | Lys | Pro | Val | Ile | Ile | Thr | Ser | Gly | Asn | Leu | |
| | Ser | | | | | | | | | | | | | | | |
| | | 850 | | | | | 855 | | | | | 860 | | | | |
| 15 | | | | | | | | | | | | | | | | |
| | Gly | Cys | Thr | Thr | Ile | Val | Ala | Arg | Lys | Glu | Gly | Tyr | Ile | Tyr | Lys | |
| | Val | | | | | | | | | | | | | | | |
| | 865 | | | | | 870 | | | | | 875 | | | | | |
| 20 | 880 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | His | Thr | Gly | Thr | Thr | Lys | Ser | Leu | Ala | Gly | Phe | Thr | Ser | Thr | Thr | |
| | Gly | | | | | | | | | | | | | | | |
| 25 | | | | 885 | | | | | | 890 | | | | 895 | | |
| | | | | | | | | | | | | | | | | |
| | Val | Lys | Lys | Ala | Val | Glu | Val | Leu | Glu | Leu | Leu | Thr | Lys | Glu | Pro | |
| | Ile | | | | | | | | | | | | | | | |
| 30 | | | | 900 | | | | | 905 | | | | | 910 | | |
| | | | | | | | | | | | | | | | | |
| | Pro | Arg | Val | Glu | Gly | Ile | Met | Ser | Asn | Asp | Phe | Leu | Val | Asp | Tyr | |
| | Leu | | | | | | | | | | | | | | | |
| 35 | | | 915 | | | | | 920 | | | | | 925 | | | |
| | | | | | | | | | | | | | | | | |
| | Ser | Glu | Asn | Phe | Glu | Asp | Ser | Leu | Ile | Thr | Tyr | Ser | Ser | Ser | Glu | |
| | Lys | | | | | | | | | | | | | | | |
| 40 | | 930 | | | | | 935 | | | | | 940 | | | | |
| | | | | | | | | | | | | | | | | |
| | Lys | Pro | Asp | Ser | Gln | Ile | Thr | Ile | Ile | Arg | Asp | Asn | Val | Ser | Val | |
| | Phe | | | | | | | | | | | | | | | |
| 45 | 945 | | | | | 950 | | | | | 955 | | | | | |
| | 960 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | Pro | Tyr | Phe | Leu | Asp | Asn | Ile | Pro | Glu | His | Gly | Phe | Gly | Thr | Ser | |
| 50 | Ala | | | | | | | | | | | | | | | |
| | | | | 965 | | | | | | 970 | | | | 975 | | |

Thr Val Leu Val Arg Val Asp Gly Asn Val Val Val Arg Ser Leu
 Ser
 5 980 985 990

Glu Ser Tyr Ser Leu Asn Ala Asp Ala Ser Glu Ile Ser Val Leu
 Lys
 10 995 1000 1005

Val Phe Ser Lys Lys Phe
 1010
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 20 <213> Escherichia coli
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 Ala
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Gln Thr Asp Val Leu Val Ile Gly Gly Gly Pro Ala Gly Leu Ser
 Ala
 30 20 25 30

Ala Ile Ala Ala Gly Arg Leu Gly Ala Arg Thr Met Ile Val Glu
 Arg
 35 35 40 45

Tyr Gly Ser Leu Gly Gly Val Leu Thr Gln Val Gly Val Glu Ser
 Phe
 40 50 55 60

Ala Trp Tyr Arg His Pro Gly Thr Glu Asp Cys Glu Gly Ile Cys
 Arg
 45 65 70 75 80

Glu Tyr Glu Gly Arg Ala Arg Ala Leu Gly Phe Thr Arg Pro Glu
 Pro
 50 85 90 95

| | | |
|----|-------------------------------------------------------------|---------|
| | Gln Ser Ile Ser Glu Val Ile Asp Thr Glu Gly Phe Lys Val Val | |
| | Ala | |
| 5 | 100 | 105 110 |
| | Asp Gln Met Ile Thr Glu Ser Gly Val Glu Pro Leu Tyr His Ser | |
| | Trp | |
| 10 | 115 | 120 125 |
| | Val Val Asp Val Ile Lys Asp Gly Asp Thr Leu Cys Gly Val Ile | |
| | Val | |
| 15 | 130 | 135 140 |
| | Glu Asn Lys Ser Gly Arg Gly Ala Ile Leu Ala Lys Arg Ile Val | |
| | Asp | |
| 20 | 145 | 150 155 |
| | 160 | |
| | Cys Thr Gly Asp Ala Asp Ile Ala Ala Arg Ala Gly Ala Pro Trp | |
| | Thr | |
| 25 | 165 | 170 175 |
| | Lys Arg Ser Lys Asp Gln Leu Met Gly Val Thr Val Met Phe Ser | |
| | Cys | |
| 30 | 180 | 185 190 |
| | Ala Gly Val Asp Val Ala Arg Phe Asn Arg Phe Val Ala Glu Glu | |
| | Leu | |
| 35 | 195 | 200 205 |
| | Lys Pro Thr Tyr Ala Asp Trp Gly Lys Asn Trp Thr Ile Gln Thr | |
| | Thr | |
| 40 | 210 | 215 220 |
| | Gly Lys Glu Asp Pro Met Phe Ser Pro Tyr Met Glu Asp Ile Phe | |
| | Thr | |
| 45 | 225 | 230 235 |
| | 240 | |
| | Arg Ala Gln Gln Asp Gly Val Ile Pro Gly Asp Ala Gln Ala Ile | |
| | Ala | |
| 50 | 245 | 250 255 |

| | | | | |
|----|----------------------------------------------------------------------------------|-----|-----|-----|
| 5 | Gly Thr Trp Ser Thr Phe Ser Glu Ser Gly Glu Ala Phe Gln Met Asn | 260 | 265 | 270 |
| 10 | Met Val Tyr Ala Phe Gly Phe Asp Cys Thr Asp Val Phe Asp Leu Thr | 275 | 280 | 285 |
| 15 | Lys Ala Glu Ile Ala Gly Arg Gln Gln Ala Leu Trp Ala Ile Asp Ala | 290 | 295 | 300 |
| 20 | Leu Arg His Tyr Val Pro Gly Phe Glu Asn Val Arg Leu Arg Asn Phe 305 320 | 310 | 315 | |
| 25 | Gly Ala Thr Leu Gly Thr Arg Glu Ser Arg Leu Ile Glu Gly Glu Ile | 325 | 330 | 335 |
| 30 | Arg Ile Ala Asp Asp Tyr Val Leu Asn Gln Gly Arg Cys Ser Asp Ser | 340 | 345 | 350 |
| 35 | Val Gly Ile Phe Pro Glu Phe Ile Asp Gly Ser Gly Tyr Leu Ile Leu | 355 | 360 | 365 |
| 40 | Pro Thr Thr Gly Arg Phe Phe Gln Ile Pro Tyr Gly Cys Leu Val Pro | 370 | 375 | 380 |
| 45 | Gln Lys Val Glu Asn Leu Leu Val Ala Gly Arg Cys Ile Ser Ala Gly 385 400 | 390 | 395 | |
| 50 | Val Val Ala His Thr Ser Met Arg Asn Met Met Cys Cys Ala Val Thr | | | |

| | | | |
|----|--------------------------------------------------------------------------|-----|----------|
| | 405 | 410 | 415 |
| 5 | Gly Glu Ala Ala Gly Thr Ala Ala Val Val Ser Leu Gln Gln Asn Cys | 420 | 425 430 |
| 10 | Thr Val Arg Gln Val Ala Ile Pro Asp Leu Gln Asn Thr Leu Gln Gln | 435 | 440 445 |
| 15 | Gln Gly Val Arg Leu Ala | 450 | |
| 20 | <210> 11 <211> 253 <212> PRT <213> Escherichia coli <400> 11 | | |
| 25 | Met Ser Ala Lys Arg Arg Leu Leu Ile Ala Cys Thr Leu Ile Thr Ala | 1 | 5 10 15 |
| 30 | Ile Tyr His Phe Pro Ala Tyr Ser Ser Leu Glu Tyr Lys Gly Thr Phe | 20 | 25 30 |
| 35 | Gly Ser Ile Asn Ala Gly Tyr Ala Asp Trp Asn Ser Gly Phe Val Asn | 35 | 40 45 |
| 40 | Thr His Arg Gly Glu Val Trp Lys Val Thr Ala Asp Phe Gly Val Asn | 50 | 55 60 |
| 45 | Phe Lys Glu Ala Glu Phe Tyr Ser Phe Tyr Glu Ser Asn Val Leu Asn | 65 | 70 75 80 |
| 50 | His Ala Val Ala Gly Arg Asn His Thr Val Ser Ala Met Thr His Val | 85 | 90 95 |

| | | | | | | | | | | | | | | | | |
|----|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 5 | Arg Gln | Leu | Phe | Asp | Ser | Asp | Met | Thr | Phe | Phe | Gly | Lys | Ile | Tyr | Gly | |
| | | | | 100 | | | | | 105 | | | | | | 110 | |
| 10 | Trp Gly | Asp | Asn | Ser | Trp | Gly | Asp | Asp | Leu | Asp | Met | Phe | Tyr | Gly | Phe | |
| | | | | 115 | | | | | 120 | | | | | 125 | | |
| 15 | Tyr Gly | Leu | Gly | Trp | Asn | Gly | Glu | Trp | Gly | Phe | Phe | Lys | Pro | Tyr | Ile | |
| | | | 130 | | | | | | 135 | | | | | 140 | | |
| 20 | Leu Thr | His | Asn | Gln | Ser | Gly | Asp | Tyr | Val | Ser | Ala | Lys | Tyr | Gly | Gln | |
| | 145 160 | | | | | | | | 150 | | | | | 155 | | |
| 25 | Asn Phe | Gly | Trp | Asn | Gly | Tyr | Val | Val | Gly | Trp | Thr | Ala | Val | Leu | Pro | |
| | | | | | | | | | 165 | | | | | 170 | | 175 |
| 30 | Thr Glu | Leu | Phe | Asp | Glu | Lys | Phe | Val | Leu | Ser | Asn | Trp | Asn | Glu | Ile | |
| | | | | | 180 | | | | | | | 185 | | | 190 | |
| 35 | Leu Gly | Asp | Arg | Asn | Asp | Ala | Tyr | Thr | Glu | Gln | Gln | Phe | Gly | Arg | Asn | |
| | | | | | | | | | 195 | | | | | 200 | | 205 |
| 40 | Leu Lys | Asn | Gly | Gly | Leu | Thr | Ile | Ala | Trp | Lys | Phe | Tyr | Pro | Arg | Trp | |
| | | | | | | | | | 210 | | | | | 215 | | 220 |
| 45 | Ala Gly | Ser | Val | Thr | Trp | Arg | Tyr | Phe | Asp | Asn | Lys | Leu | Gly | Tyr | Asp | |
| | 225 240 | | | | | | | | | | | | | 230 | | 235 |
| 50 | Phe | Gly | Asp | Gln | Met | Ile | Tyr | Met | Leu | Gly | Tyr | Asp | Phe | | | |
| | | | | | 245 | | | | | 250 | | | | | | |

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 5 <212> PRT
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 Ser
 1 5 10 15

15 Pro Ala Leu Ala Ala Glu Ala Lys Gln Pro Asn Leu Val Ile Ile
 Met
 20 25 30

20 Ala Asp Asp Leu Gly Tyr Gly Asp Leu Ala Thr Tyr Gly His Gln
 Ile
 35 40 45

25 Val Lys Thr Pro Asn Ile Asp Arg Leu Ala Gln Glu Gly Val Lys
 Phe
 50 55 60

30 Thr Asp Tyr Tyr Ala Pro Ala Pro Leu Ser Ser Pro Ser Arg Ala
 Gly
 65 70 75 80

35 Leu Leu Thr Gly Arg Met Pro Phe Arg Thr Gly Ile Arg Ser Trp
 Ile
 85 90 95

40 Pro Ser Gly Lys Asp Val Ala Leu Gly Arg Asn Glu Leu Thr Ile
 Ala
 100 105 110

45 Asn Leu Leu Lys Ala Gln Gly Tyr Asp Thr Ala Met Met Gly Lys
 Leu
 115 120 125

50 His Leu Asn Ala Gly Gly Asp Arg Thr Asp Gln Pro Gln Ala Gln
 Asp
 130 135 140

| | | |
|----|----------------------------------------------------------------------------------|-------------|
| | Met Gly Phe Asp Tyr Ser Leu Ala Asn Thr Ala Gly Phe Val Thr | |
| 5 | Asp 145 160 | 150 155 |
| 10 | Ala Thr Leu Asp Asn Ala Lys Glu Arg Pro Arg Tyr Gly Met Val Tyr | 165 170 175 |
| 15 | Pro Thr Gly Trp Leu Arg Asn Gly Gln Pro Thr Pro Arg Ala Asp Lys | 180 185 190 |
| 20 | Met Ser Gly Glu Tyr Val Ser Ser Glu Val Val Asn Trp Leu Asp Asn | 195 200 205 |
| 25 | Lys Lys Asp Ser Lys Pro Phe Phe Leu Tyr Val Ala Phe Thr Glu Val | 210 215 220 |
| 30 | His Ser Pro Leu Ala Ser Pro Lys Lys Tyr Leu Asp Met Tyr Ser Gln 225 240 | 230 235 |
| 35 | Tyr Met Ser Ala Tyr Gln Lys Gln His Pro Asp Leu Phe Tyr Gly Asp | 245 250 255 |
| 40 | Trp Ala Asp Lys Pro Trp Arg Gly Val Gly Glu Tyr Tyr Ala Asn Ile | 260 265 270 |
| 45 | Ser Tyr Leu Asp Ala Gln Val Gly Lys Val Leu Asp Lys Ile Lys Ala | 275 280 285 |
| 50 | Met Gly Glu Glu Asp Asn Thr Ile Val Ile Phe Thr Ser Asp Asn Gly | |

| | 290 | | 295 | | 300 |
|----|----------------------------------------------------------------------------------|--|-----|--|---------|
| 5 | Pro Val Thr Arg Glu Ala Arg Lys Val Tyr Glu Leu Asn Leu Ala Gly 305 320 | | 310 | | 315 |
| 10 | Glu Thr Asp Gly Leu Arg Gly Arg Lys Asp Asn Leu Trp Glu Gly Gly | | 325 | | 330 335 |
| 15 | Ile Arg Val Pro Ala Ile Ile Lys Tyr Gly Lys His Leu Pro Gln Gly | | 340 | | 345 350 |
| 20 | Met Val Ser Asp Thr Pro Val Tyr Gly Leu Asp Trp Met Pro Thr Leu | | 355 | | 360 365 |
| 25 | Ala Lys Met Met Asn Phe Lys Leu Pro Thr Asp Arg Thr Phe Asp Gly | | 370 | | 375 380 |
| 30 | Glu Ser Leu Val Pro Val Leu Glu Gln Lys Ala Leu Lys Arg Glu Lys 385 400 | | 390 | | 395 |
| 35 | Pro Leu Ile Phe Gly Ile Asp Met Pro Phe Gln Asp Asp Pro Thr Asp | | 405 | | 410 415 |
| 40 | Glu Trp Ala Ile Arg Asp Gly Asp Trp Lys Met Ile Ile Asp Arg Asn | | 420 | | 425 430 |
| 45 | Asn Lys Pro Lys Tyr Leu Tyr Asn Leu Lys Ser Asp Arg Tyr Glu Thr | | 435 | | 440 445 |
| 50 | | | | | |

Leu Asn Leu Ile Gly Lys Lys Pro Asp Ile Glu Lys Gln Met Tyr
 Gly
 450 455 460

5
 Lys Phe Leu Lys Tyr Lys Thr Asp Ile Asp Asn Asp Ser Leu Met
 Lys
 465 470 475
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 Ala Arg Gly Asp Lys Pro Glu Ala Val Thr Trp Gly
 485 490

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 Pro
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 Ile Ala Lys Gly Phe Arg Asn Glu Arg Gly Phe Val Thr Thr Thr
 Ile
 20 25 30

30
 Cys Ala Met Gly Glu Leu Leu Ala Glu Phe Leu Ser Arg Asn Pro
 His
 35 40 45

Gln Lys Phe Thr Gln Pro Gly Glu Phe Ile Gly Pro Phe Pro Ser
 Gly
 50 55 60

40
 Ala Pro Ala Ile Phe Ala Ala Gln Val Ala Lys Leu Ser His Arg
 Ala
 65 70 75 80

45
 Ile Phe Phe Gly Cys Val Gly Asn Asp Asp Phe Ala Arg Leu Ile
 Ile
 85 90 95

50

| | | | | | | | | | | | | | | | |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | Glu | Arg | Leu | Arg | His | Glu | Gly | Val | Ile | Thr | Asp | Gly | Ile | His | Val |
| | Met | | | | | | | | | | | | | | |
| | | | | 100 | | | | | 105 | | | | | 110 | |
| 5 | Asn | Asn | Ala | Val | Thr | Gly | Thr | Ala | Phe | Val | Ser | Tyr | Gln | Asn | Pro |
| | Gln | | | | | | | | | | | | | | |
| | | | 115 | | | | | 120 | | | | | 125 | | |
| 10 | Gln | Arg | Asp | Phe | Val | Phe | Asn | Ile | Pro | Asn | Ser | Ala | Cys | Gly | Leu |
| | Phe | | | | | | | | | | | | | | |
| | | 130 | | | | | | 135 | | | | 140 | | | |
| 15 | Thr | Ala | Glu | His | Ile | Asp | Lys | Asp | Leu | Leu | Lys | Gln | Cys | Asn | His |
| | Leu | | | | | | | | | | | | | | |
| | 145 | | | | | 150 | | | | | 155 | | | | |
| | 160 | | | | | | | | | | | | | | |
| 20 | His | Ile | Val | Gly | Ser | Ser | Leu | Phe | Ser | Phe | Arg | Met | Ile | Asp | Val |
| | Met | | | | | | | | | | | | | | |
| | | | | 165 | | | | | | 170 | | | | 175 | |
| 25 | Arg | Lys | Ala | Ile | Thr | Thr | Ile | Lys | Ser | Ala | Gly | Gly | Thr | Val | Ser |
| | Phe | | | | | | | | | | | | | | |
| | | | 180 | | | | | | | 185 | | | | 190 | |
| 30 | Asp | Pro | Asn | Ile | Arg | Lys | Glu | Met | Leu | Ser | Ile | Pro | Glu | Met | Ala |
| | Gln | | | | | | | | | | | | | | |
| | | | 195 | | | | | 200 | | | | | 205 | | |
| 35 | Ala | Leu | Asp | Tyr | Leu | Ile | Glu | Tyr | Thr | Asp | Ile | Phe | Ile | Pro | Ser |
| | Glu | | | | | | | | | | | | | | |
| | | 210 | | | | | | 215 | | | | 220 | | | |
| 40 | Ser | Glu | Leu | Pro | Phe | Phe | Ala | Arg | His | Lys | Asn | Leu | Ser | Glu | Glu |
| | Gln | | | | | | | | | | | | | | |
| | 225 | | | | | 230 | | | | | 235 | | | | |
| 45 | 240 | | | | | | | | | | | | | | |
| | Ile | Val | Ser | Asp | Leu | Leu | His | Gly | Gly | Val | Lys | His | Val | Ala | Ile |
| | Lys | | | | | | | | | | | | | | |
| 50 | | | | 245 | | | | | | 250 | | | | 255 | |

Arg Ala Gln Arg Gly Ala Ser Tyr Tyr Lys Leu Lys Asn Gly Thr
 Leu
 260 265 270
 5

His Ala Gln His Val Ala Gly His Asp Ile Glu Ile Ile Asp Pro
 Thr
 275 280 285
 10

Gly Ala Gly Asp Cys Phe Gly Ala Thr Phe Ile Thr Leu Phe Leu
 Ser
 290 295 300
 15

Gly Phe Pro Ala His Lys Ala Leu Gln Tyr Ala Asn Ala Ser Gly
 Ala
 305 310 315
 20 320

Leu Ala Val Met Arg Gln Gly Pro Met Glu Gly Ile Ser Ser Leu
 Ala
 325 330 335
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Asp Ile Glu Asp Phe Leu Gln Gln His
 340 345
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Met Tyr Met Pro Gly Lys Gln Met Leu Cys Cys Ile Leu Ile Ser
 Ile
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Ile Ser Glu Gly Asp Met Lys Ile Phe Ile Ser Leu Phe Leu Phe
 Ile
 20 25 30
 45

Ile Ser Thr Asn Ser Phe Ala Asp Asp Ile Thr His Ala Gly Val
 Val
 35 40 45
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Arg Ile Glu Gly Leu Ile Thr Glu Lys Thr Cys Ile Ile Ser Asp
 Glu
 50 55 60
 5

Ser Lys Asn Phe Thr Val Asn Met Pro Asp Val Pro Ser Ser Ser
 Val
 65 70 75 80
 10

Arg Ser Ala Gly Asp Val Thr Glu Lys Val Tyr Phe Ser Ile Thr
 Leu
 85 90 95
 15

Thr Arg Cys Gly Ser Asp Val Gly Asn Ala Tyr Ile Lys Phe Thr
 Gly
 100 105 110
 20

Asn Thr Val Ser Glu Asp Ala Ser Leu Tyr Lys Leu Glu Asp Gly
 Ser
 115 120 125
 25

Val Glu Gly Leu Ala Leu Thr Ile Phe Asp Lys Asn Lys Gly Ser
 Ile
 130 135 140
 30

Ser Asn Asp Val Lys Ser Met Val Phe Ser Leu Thr Ser Ser Val
 Asp
 145 150 155
 35 160

Asn Ile Leu His Phe Phe Ala Ala Tyr Lys Ala Leu Lys Asn Asn
 Val
 165 170 175
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Gln Pro Gly Asp Ala Asn Ala Ser Val Ser Phe Ile Val Thr Tyr
 Asp
 180 185 190
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 50 <212> PRT
 <213> Escherichia coli

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|----|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 5 | Met Val 1 | Ile | Lys | Phe | Arg | Leu | Tyr | Ile | Pro | Pro | Val | Ile | Leu | Gly | Phe | 15 |
| 10 | Ile Leu | Val | Pro | Leu | Leu | Val | Trp | Pro | Thr | Val | Ile | Ala | Leu | Ala | Val | 30 |
| 15 | Ile Leu | Phe | Thr | Leu | Thr | Phe | Leu | Ala | Glu | Ile | Ile | Phe | Ser | Phe | Pro | 45 |
| 20 | Leu Val | Val | Arg | Ile | Ser | Leu | Gln | Glu | Leu | Gln | Leu | Glu | Leu | Leu | | 60 |
| 25 | Val Phe 65 | Tyr | Ala | Leu | Phe | Phe | Ser | Val | Met | Gly | Gly | Ile | Gly | Trp | Gln | 80 |
| 30 | Ser Leu | Arg | Arg | Thr | Pro | Pro | Glu | Leu | Lys | Asn | Arg | Leu | His | Cys | Trp | 95 |
| 35 | Val Leu | Phe | Ser | Pro | Val | Tyr | Phe | Trp | Leu | Ile | Leu | Ser | Asn | Phe | Ile | 110 |
| 40 | Tyr Phe | Ile | Ser | Pro | Glu | Lys | Ser | Ala | Leu | Leu | Glu | Asn | Ile | Arg | Asn | 125 |
| 45 | Phe Pro | Leu | Thr | Phe | Val | Trp | Leu | Pro | Leu | Asn | Phe | Ser | Pro | Phe | Trp | 140 |
| 50 | Gln Phe 145 160 | Pro | Trp | Thr | Asp | Phe | Val | Gly | Pro | Ile | Ser | Ala | Gln | Leu | Gly | 155 |

Ala Leu Gly Tyr Tyr Cys Gln Trp Arg Ser Lys Asn Arg Ser His
 Arg
 5 165 170 175

Lys Lys Trp Gly Asp Trp Val Thr Cys Leu Ser Leu Ala Ile Leu
 Ala
 10 180 185 190

Leu Gly Pro Leu Phe Asn Tyr Leu Gln
 195 200
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 20 <213> Escherichia coli
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Met Lys Phe Asn Leu Ser Asn Leu Ser Ala Val Leu Leu Ala Ser
 Gly
 25 1 5 10 15

Met Leu Met Ser Thr Ala Val Thr Ala Ala Pro Gly Asp Ala Thr
 Gln
 30 20 25 30

Phe Gly Gly Ala Asp Thr Asp Trp Ser Thr Val Asp Tyr Pro Arg
 Leu
 35 35 40 45

Thr Asp Met Asp Asp Asn Val Asp Ser Met Gly Gly Lys Ile Arg
 Phe
 40 50 55 60

Thr Gly Arg Val Val Lys Ala Thr Cys Lys Val Ala Thr Asp Ser
 Lys
 45 65 70 75 80

Gln Ile Glu Val Val Leu Pro Val Val Pro Ser Asn Leu Phe Thr
 Gly
 50 85 90 95

Ile Asp Val Glu Ala Gln Gly Ala Ser Asn Gln Thr Asp Phe Asn
 Ile
 100 105 110
 5

Asn Leu Thr Glu Cys Ser Asn Thr Asp Asp Gln Lys Ile Glu Phe
 Arg
 115 120 125
 10

Phe Thr Gly Thr Ala Asp Ser Ala Asn Lys Thr Leu Ala Asn Glu
 Val
 130 135 140
 15

Glu Gly Ser Thr Asp Ala Asp Asn Ser Gly Asn Ala Gly Ala Thr
 Gly
 145 150 155
 20 160

Val Gly Ile Arg Ile Tyr Ser Lys Gly Thr Thr Asn Asn Gly Leu
 Ile
 165 170 175
 25

Asn Leu Asn Thr Thr Ala Ala Glu Gly Ser Ala Ser Thr Ala Ala
 Tyr
 180 185 190
 30

Thr Ile Pro Gly Asn Ala Thr Thr His Asp Phe Ser Ala Ala Phe
 Thr
 195 200 205
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Ala Gly Tyr Ala Gln Asn Gly Ser Thr Val Ala Pro Gly Val Val
 Lys
 210 215 220
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Ser Thr Ala Ser Phe Val Val Leu Tyr Glu
 225 230
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 50 <213> Escherichia coli
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Ile Val  Pro  Phe  Glu  Asn  Tyr  Asn  Thr  Asn  Tyr  Pro  Gly  Asp  Arg
Ser
145              150              155
160

```

| | Lys | Pro | Ser | Asn | Trp | Ala | Ser | Gly | Thr | Glu | Gly | Tyr | Ile | Lys | Ile |
|----|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 5 | Arg | | | | | 165 | | | | 170 | | | | | 175 |
| 10 | Ile Leu | Asp | Lys | Lys | Ile | Ile | Ser | Asp | Val | Ser | Leu | Ser | Asn | Val | Leu |
| | | | | 180 | | | | | 185 | | | | | 190 | |
| 15 | Val Pro | Ser | Leu | Tyr | Val | Ser | Gln | Ile | Pro | Thr | Glu | His | Gly | Pro | Ile |
| | | | 195 | | | | | 200 | | | | | 205 | | |
| 20 | Val Gly | Phe | Asn | Ala | Tyr | Ile | Gly | Asn | Leu | Asn | Ile | Gln | Val | Pro | Gln |
| | | 210 | | | | | 215 | | | | | 220 | | | |
| 25 | Cys Val 225 240 | Thr | Ile | Asn | Glu | Gly | Thr | Ser | Phe | Thr | Val | Asn | Met | Pro | Asp |
| | | | | | | 230 | | | | | 235 | | | | |
| 30 | Trp Gly | Ala | Ser | Glu | Leu | Ser | Arg | Ala | Gly | Ala | Gly | Ala | Lys | Pro | Ala |
| | | | | 245 | | | | | 250 | | | | | | 255 |
| 35 | Val Asp | Thr | Pro | Val | Ala | Thr | Thr | Ile | Pro | Ile | Asn | Cys | Thr | Asn | Lys |
| | | | 260 | | | | | 265 | | | | | 270 | | |
| 40 | Thr Thr | Asp | Ala | Val | Met | Thr | Leu | Val | Phe | Asp | Gly | Asn | Ile | Ser | Ala |
| | | | 275 | | | | | 280 | | | | | 285 | | |
| 45 | Arg Pro | Asp | Thr | Asn | Gly | Lys | Gln | Ser | Ile | Ile | Gln | Ala | Gln | Asp | Asn |
| | | 290 | | | | | 295 | | | | | 300 | | | |
| 50 | Asp Leu 305 320 | Val | Gly | Ile | Met | Ile | Met | Asp | Ser | Gln | Gln | Asn | Ser | Val | Asp |
| | | | | | | 310 | | | | | 315 | | | | |

| | | | | | | | | | | | | | | | |
|----|-------|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | Asn | Ala | Leu | Ala | Thr | Ser | Val | Gly | Val | Pro | Phe | Arg | Leu | Val | Glu |
| 5 | Asn | | | | | | | | | | | | | | |
| | | | | | 325 | | | | | 330 | | | | | 335 |
| | <210> | 18 | | | | | | | | | | | | | |
| | <211> | 864 | | | | | | | | | | | | | |
| 10 | <212> | PRT | | | | | | | | | | | | | |
| | <213> | Escherichia coli | | | | | | | | | | | | | |
| | <400> | 18 | | | | | | | | | | | | | |
| | Met | Asn | Leu | Lys | Leu | Lys | Arg | Cys | Glu | Tyr | Trp | Met | Ala | Ala | Gln |
| 15 | Lys | | | | | | | | | | | | | | |
| | 1 | | | | 5 | | | | | 10 | | | | | 15 |
| | Gln | Met | Lys | Arg | Val | Val | Pro | Leu | Leu | Leu | Val | Ile | Met | Pro | Ala |
| 20 | Cys | | | | | | | | | | | | | | |
| | | | | 20 | | | | | 25 | | | | | 30 | |
| | Ser | Ile | Ala | Gly | Met | Arg | Phe | Asn | Pro | Ala | Phe | Leu | Ser | Gly | Asp |
| 25 | Thr | | | | | | | | | | | | | | |
| | | | 35 | | | | | 40 | | | | | 45 | | |
| | Glu | Ala | Val | Ala | Asp | Leu | Ser | Arg | Phe | Glu | Lys | Gly | Met | Thr | Tyr |
| 30 | Leu | | | | | | | | | | | | | | |
| | | 50 | | | | | 55 | | | | | 60 | | | |
| | Pro | Gly | Ser | Tyr | Glu | Val | Glu | Val | Trp | Val | Asn | Asp | Ser | Pro | Leu |
| 35 | Leu | | | | | | | | | | | | | | |
| | 65 | | | | | 70 | | | | 75 | | | | | 80 |
| | Ser | Arg | Thr | Val | Thr | Phe | Lys | Ala | Asp | Asp | Glu | Asn | Gln | Leu | Ile |
| 40 | Pro | | | | | | | | | | | | | | |
| | | | | | | 85 | | | | 90 | | | | | 95 |
| | Cys | Leu | Ser | Leu | Ala | Asp | Leu | Leu | Ser | Leu | Gly | Ile | Asn | Lys | Asn |
| 45 | Ala | | | | | | | | | | | | | | |
| | | | | 100 | | | | | 105 | | | | | 110 | |
| | Leu | Pro | Glu | Gln | Ala | Leu | Ala | Ser | Ser | Glu | Asn | Ser | Cys | Leu | Asp |
| 50 | Leu | | | | | | | | | | | | | | |
| | | | | 115 | | | | 120 | | | | | 125 | | |

| | | | | |
|----|--------------------------------------------------------------------|-----|-----|-----|
| 5 | Arg Ile Trp Phe Pro Asp Val His Tyr Met Pro Glu Leu Asp Ala Gln | 130 | 135 | 140 |
| 10 | Arg Leu Lys Leu Thr Phe Pro Gln Ala Ile Ile Lys Arg Asp Ala Arg | 145 | 150 | 155 |
| | 160 | | | |
| 15 | Gly Tyr Ile Pro Pro Glu Gln Trp Asp Asn Gly Ile Thr Ala Phe Leu | 165 | 170 | 175 |
| 20 | Leu Asn Tyr Asp Phe Ser Gly Asn Asn Asp Arg Gly Asp Tyr Ser Ser | 180 | 185 | 190 |
| 25 | Asn Asn Tyr Tyr Leu Asn Leu Arg Ala Gly Ile Asn Ile Gly Ala Trp | 195 | 200 | 205 |
| 30 | Arg Phe Arg Asp Tyr Ser Thr Trp Ser Arg Gly Ser Asn Ser Ala Gly | 210 | 215 | 220 |
| 35 | Lys Leu Glu His Ile Ser Ser Thr Leu Gln Arg Val Ile Ile Pro Phe | 225 | 230 | 235 |
| | 240 | | | |
| 40 | Arg Ser Glu Leu Thr Leu Gly Asp Thr Trp Ser Ser Ser Asp Val Phe | 245 | 250 | 255 |
| 45 | Asp Ser Val Ser Ile Arg Gly Ile Lys Leu Glu Ser Asp Glu Asn Met | 260 | 265 | 270 |
| 50 | Leu Pro Asp Ser Gln Ser Gly Phe Ala Pro Thr Val Arg Gly Ile Ala | | | |

| | 275 | 280 | 285 |
|----|----------------------------------------------------------------------------------|-----|-----|
| 5 | Lys Ser Arg Ala Gln Val Thr Ile Lys Gln Asn Gly Tyr Val Ile Tyr 290 | 295 | 300 |
| 10 | Gln Thr Tyr Met Pro Pro Gly Pro Phe Glu Ile Ser Asp Leu Asn Pro 305 320 | 310 | 315 |
| 15 | Thr Ser Ser Ala Gly Asp Leu Glu Val Thr Ile Lys Glu Ser Asp Asn 325 | 330 | 335 |
| 20 | Ser Glu Thr Val Tyr Thr Val Pro Tyr Ala Ala Val Pro Ile Leu Gln 340 | 345 | 350 |
| 25 | Arg Glu Gly His Leu Lys Tyr Ser Thr Thr Val Gly Gln Tyr Arg Ser 355 | 360 | 365 |
| 30 | Asn Ser Tyr Asn Gln Lys Ser Pro Tyr Val Phe Gln Gly Glu Leu Ile 370 | 375 | 380 |
| 35 | Trp Gly Leu Pro Trp Asp Ile Thr Ala Tyr Gly Gly Ala Gln Phe Ser 385 400 | 390 | 395 |
| 40 | Glu Asp Tyr Arg Ala Leu Ala Leu Gly Leu Gly Leu Asn Leu Gly Val 405 | 410 | 415 |
| 45 | Phe Gly Ala Thr Ser Phe Asp Val Thr Gln Ala Asn Ser Ser Leu Val 420 | 425 | 430 |
| 50 | | | |

Asp Gly Ser Lys His Gln Gly Gln Ser Tyr Arg Phe Leu Tyr Ser
Lys

445

5 Ser Leu Val Gln Thr Gly Thr Ala Phe His Ile Ile Gly Tyr Arg
Tyr

460

10 Ser Thr Gln Gly Phe Tyr Thr Leu Ser Asp Thr Thr Tyr Gln Gln
Met

475

480

15
Ser Gly Thr Val Val Asp Pro Lys Thr Leu Asp Asp Lys Asp Tyr
Val

495

20

Tyr Asn Trp Asn Asp Phe Tyr Asn Leu Arg Tyr Ser Lys Arg Gly
Lys

510

25 .

Phe Gln Ala Ser Val Ser Gln Pro Phe Gly Asn Tyr Gly Ser Met
Tyr

525

30

Leu Ser Ala Ser Gln Gln Thr Tyr Trp Asn Thr Asp Lys Lys Asp
Ser

540

35
Leu Tyr Gln Val Gly Tyr Asn Thr Ser Ile Lys Gly Ile Tyr Leu
Asn

555

560

Val Ala Trp Asn Tyr Ser Lys Ser Pro Gly Thr Asn Ala Asp Lys
Ile

575

| 45 | 565 | 570 | 575 |
|-------------------------------------------------------------|-----|-----|-----|
| Val Ser Leu Asn Val Ser Leu Pro Ile Ser Asn Trp Leu Ser Ser | | | |

Thr

50 580 585 590

590

| | | | | |
|----|--------------------------------------------------------------------|-----|-----|-----|
| 5 | Asn Asp Gly Arg Ser Ser Ser Asn Ala Met Thr Ala Thr Tyr Gly Tyr | 595 | 600 | 605 |
| 10 | Ser Gln Asp Asn His Gly Gln Val Asn Gln Tyr Thr Gly Val Ser Gly | 610 | 615 | 620 |
| 15 | Ser Leu Leu Glu Gln His Asn Leu Ser Tyr Asn Ile Gln His Gly Phe | 625 | 630 | 635 |
| | 640 | | | |
| 20 | Ala Asn Gln Asp Asn Ser Ser Ser Gly Ser Val Gly Val Asn Tyr Arg | 645 | 650 | 655 |
| 25 | Gly Ala Tyr Gly Ser Leu Asn Ser Ala Tyr Ser Tyr Asp Asn Glu Gly | 660 | 665 | 670 |
| 30 | Asn Gln Gln Ile Asn Tyr Gly Ile Ser Gly Ala Leu Val Val His Glu | 675 | 680 | 685 |
| 35 | Asn Gly Leu Thr Leu Ser Gln Pro Leu Gly Glu Thr Asn Val Leu Ile | 690 | 695 | 700 |
| 40 | Lys Ala Pro Gly Ala Asn Asn Val Asp Val Gln Arg Gly Thr Gly Ile | 705 | 710 | 715 |
| | 720 | | | |
| 45 | Ser Thr Asp Trp Arg Gly Tyr Ala Val Val Pro Tyr Ala Thr Glu Tyr | 725 | 730 | 735 |
| 50 | Arg Arg Asn Asn Ile Ser Leu Asp Pro Met Ser Met Asn Met His Thr | 740 | 745 | 750 |

Glu Leu Asp Ile Thr Ser Thr Glu Val Ile Pro Gly Lys Gly Ala
 Leu
 5 755 760 765

Val Arg Ala Glu Phe Ala Ala His Ile Gly Ile Arg Gly Leu Phe
 Thr
 10 770 775 780

Val Arg Tyr Arg Asn Lys Ser Val Pro Phe Gly Ala Thr Ala Ser
 Ala
 15 785 790 795
 800

Gln Ile Lys Asn Ser Ser Gln Ile Thr Gly Ile Val Gly Asp Asn
 Gly
 20 805 810 815

Gln Leu Tyr Leu Ser Gly Leu Pro Leu Glu Gly Val Ile Asn Ile
 Gln
 25 820 825 830

Trp Gly Asp Gly Val Gln Gln Lys Cys Gln Ala Asn Tyr Lys Leu
 Pro
 30 835 840 845

Glu Thr Glu Leu Asp Asn Pro Val Ser Tyr Ala Thr Leu Glu Cys
 Arg
 35 850 855 860

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Met Gly Ala Ile Tyr Val Lys Arg Leu Ile Leu Ser Val Ala Leu
 Ile
 1 5 10 15
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Ile Pro Ile Ala Ser Asn Ala Ser Asp Ala Leu Asn Gln Pro Ser
 Ser
 20 25 30
 50

Ser Leu Asn Asp Gly Val Glu Thr Phe Phe Ile Ser Cys Phe Asp
Met

35

40

45

5

Pro Gln Glu Thr Thr Thr Asp Met Asp Ala Cys Gln Arg Val Gln
Leu

50

55

60

10

Ala Gln Val Ser Trp Val Lys Asn Lys Tyr Ser Val Ala Ala Leu
Asn

65

70

75

80

15

Arg Leu Lys Gln Asp Asn Lys Asp Asp Pro Gln Arg Leu Gln Glu
Leu

85

90

95

20

Thr Ala Ser Phe Asn Ala Glu Ser Glu Ala Trp Thr Glu Leu Ile
Glu

100

105

110

25

Lys Ala Ser Lys Ser Val Gln Val Asp Tyr Val Gly Gly Thr Ile
Ala

115

120

125

30

Gly Thr Ala Val Ala Ser Arg Gln Ile Gly Leu Leu Glu Leu Gln
Ser

130

135

140

35

His Asp Ile Trp Glu His Trp Leu Arg Ser Arg Gly Leu Asn Ser
Ser

145

150

155

160

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Ser Phe Ala Arg Thr Lys Val Gln Ile
165

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<213> Escherichia coli

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5 Pro Glu Lys Thr Phe His Gly Ser Val Ser Ala Thr Ser Ser Ser
Phe

 180 185 190

10 Gly Gly Gly Thr Gly Gln Leu Asp Ile Thr Gly Pro Ile Glu Gly
Thr
195 200 205

15 Gln Leu Ala Tyr Arg Leu Thr Gly Glu Val Gln Asp Glu Asp Tyr
Trp
210 215 220

20 Arg Asn Phe Gly Lys Glu Arg Ser Thr Phe Ile Ala Pro Ser Leu
Thr
225 230 235
240

25

Trp Phe Gly Asp Asn Ala Thr Val Thr Met Leu Tyr Ser His Arg
Asp

245 250 255

30

Tyr Lys Thr Pro Phe Asp Arg Gly Thr Ile Phe Asp Leu Thr Thr
Lys

260 265 270

35

Gln Pro Val Asn Val Asp Arg Lys Ile Arg Phe Asp Glu Pro Phe
Asn

275 280 285

40

Ile Thr Asp Gly Gln Ser Asp Leu Ala Gln Leu Asn Ala Glu Tyr
His
290 295 300

```

45      Leu Asn Ser Gln Trp Thr Ala Arg Phe Asp Tyr Ser Tyr Ser Gln
      Asp
      305              310              315
50      320

```

| | | | |
|----|-------------------------------------------------------------|-----|---------|
| | Lys Tyr Ser Asp Asn Gln Ala Arg Val Thr Ala Tyr Asp Ala Thr | | |
| | Thr | | |
| | | 325 | 330 335 |
| 5 | | | |
| | Gly Thr Leu Thr Arg Arg Val Asp Ala Thr Gln Gly Ser Thr Gln | | |
| | Arg | | |
| | | 340 | 345 350 |
| 10 | | | |
| | Met His Ala Thr Arg Ala Asp Leu Gln Gly Asn Val Asp Ile Ala | | |
| | Gly | | |
| | | 355 | 360 365 |
| 15 | | | |
| | Phe Tyr Asn Glu Ile Leu Gly Gly Val Ser Tyr Glu Tyr Tyr Asp | | |
| | Leu | | |
| | | 370 | 375 380 |
| 20 | | | |
| | Leu Arg Thr Asp Met Ile Arg Cys Lys Lys Ala Lys Asp Phe Asn | | |
| | Ile | | |
| | | 385 | 390 395 |
| 25 | | 400 | |
| | Tyr Asn Pro Val Tyr Gly Asn Thr Ser Lys Cys Thr Thr Val Ser | | |
| | Ala | | |
| | | 405 | 410 415 |
| 30 | | | |
| | Ser Asp Ser Asp Gln Thr Ile Lys Gln Glu Asn Tyr Ser Ala Tyr | | |
| | Ala | | |
| | | 420 | 425 430 |
| 35 | | | |
| | Gln Asp Ala Leu Tyr Leu Thr Asp Asn Trp Ile Ala Val Ala Gly | | |
| | Ile | | |
| | | 435 | 440 445 |
| 40 | | | |
| | Arg Tyr Gln Tyr Tyr Thr Gln Tyr Ala Gly Lys Gly Arg Pro Phe | | |
| | Asn | | |
| | | 450 | 455 460 |
| 45 | | | |
| | Val Asn Thr Asp Ser Arg Asp Glu Gln Trp Thr Pro Lys Leu Gly | | |
| | Leu | | |
| | | 465 | 470 475 |
| 50 | | 480 | |

| | | | | |
|----|--------------------------------------------------------------------|-----|-----|-----|
| 5 | Val Tyr Lys Leu Thr Pro Ser Val Ser Leu Phe Ala Asn Tyr Ser Gln | 485 | 490 | 495 |
| 10 | Thr Phe Met Pro Gln Ser Ser Ile Ala Ser Tyr Ile Gly Asp Leu Pro | 500 | 505 | 510 |
| 15 | Pro Glu Ser Ser Asn Ala Tyr Glu Val Gly Ala Lys Phe Glu Leu Phe | 515 | 520 | 525 |
| 20 | Asp Gly Ile Thr Ala Asp Ile Ala Leu Phe Asp Ile His Lys Arg Asn | 530 | 535 | 540 |
| 25 | Val Leu Tyr Thr Glu Ser Ile Gly Asp Glu Thr Ile Ala Lys Thr Ala | 545 | 550 | 555 |
| | 560 | | | |
| 30 | Gly Arg Val Arg Ser Arg Gly Val Glu Val Asp Leu Ala Gly Ala Leu | 565 | 570 | 575 |
| 35 | Thr Glu Asn Ile Asn Ile Ile Ala Ser Tyr Gly Tyr Thr Asp Ala Lys | 580 | 585 | 590 |
| 40 | Val Leu Glu Asp Pro Asp Tyr Ala Gly Lys Pro Leu Pro Asn Val Pro | 595 | 600 | 605 |
| 45 | Arg His Thr Gly Ser Leu Phe Leu Thr Tyr Asp Ile His Asn Met Pro | 610 | 615 | 620 |
| 50 | Gly Asn Asn Thr Leu Thr Phe Gly Gly Gly Gly His Gly Val Ser Arg | | | |

625 630 635
640

5 Arg Ser Ala Thr Asn Gly Ala Asp Tyr Tyr Leu Pro Gly Tyr Phe
Val
645 650 655

10 Ala Asp Ala Phe Ala Ala Tyr Lys Met Lys Leu Gln Tyr Pro Val
Thr
660 665 670

15 Leu Gln Leu Asn Val Lys Asn Leu Phe Asp Lys Thr Tyr Tyr Thr
Ser
675 680 685

20 Ser Ile Ala Thr Asn Asn Leu Gly Asn Gln Ile Gly Asp Pro Arg
Glu
690 695 700

25 Val Gln Phe Thr Val Lys Met Glu Phe
705 710

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21

Met Lys Ile Ser Trp Asn Tyr Ile Phe Lys Asn Lys Trp Arg Phe
His
1 5 10 15

35

Ile Thr Ser Ile Ser Leu Phe Leu Ile Met Leu Ala Val Ser Ile
Ala
20 25 30

40

Phe Leu His Leu Arg Phe Asn Thr Leu Ser Ser Thr Asp Lys Met
Arg
35 40 45

45

Leu Glu Met Tyr Lys Ser Thr Leu Tyr Ser Thr Ile Glu Gln Phe
Tyr
50 55 60

50

10

15

20

25

30

35

40

45

50

Val Gln Ala Lys Gln Lys Leu Gln Ser Thr Arg Gln Tyr Ser Leu
 Asp
 225 230 235
 240

5

Asn Leu Leu Pro Ala Asp Tyr Tyr Pro Cys Tyr Thr Val Ser Asn
 Phe
 245 250 255

10

Thr Phe Leu Lys Asp Lys Lys Glu Gln Leu Cys Leu Phe Pro Gln
 Tyr
 260 265 270

15

Tyr Thr Gln Gln Ile Ala Ile Pro Glu Phe Asn Trp Lys Met Thr
 Ile
 275 280 285

20

Met Val Pro Leu Asp Asn Leu Tyr Trp Ser Trp Ala Ile Ser Leu
 Val
 290 295 300

25

Ile Thr Leu Ile Ile Tyr Leu Leu Phe Leu Leu Phe Ile Lys Tyr
 Trp
 305 310 315
 320

30

Arg Met Arg Ser His Ala Gln Gln Leu Leu Thr Leu Ala Asn Glu
 Thr
 325 330 335

35

Leu Glu Lys Gln Val Lys Glu Arg Thr Ser Ala Leu Glu Leu Ile
 Asn
 340 345 350

40

Gln Lys Leu Ile Gln Glu Ile Lys Glu Arg Ser Gln Ala Glu Gln
 Val
 355 360 365

45

Leu Gln Ile Thr Arg Ser Glu Leu Ala Glu Ser Ser Lys Leu Ala
 Ala
 370 375 380

50

| | | | |
|----|-------------------------------------------------------------|-----|---------|
| | Leu Gly Gln Met Ala Thr Glu Ile Ala His Glu Gln Asn Gln Pro | | |
| | Leu | | |
| | 385 | 390 | 395 |
| 5 | 400 | | |
| | Ala Ala Ile His Ala Leu Thr Asp Asn Ala Arg Thr Met Leu Lys | | |
| | Lys | | |
| 10 | | 405 | 410 415 |
| | Glu Met Tyr Pro Gln Val Glu Gln Asn Leu Lys His Ile Ile Ser | | |
| | Val | | |
| 15 | | 420 | 425 430 |
| | Ile Glu Arg Met Thr Gln Leu Ile Ser Glu Leu Lys Ala Phe Ala | | |
| | Ser | | |
| 20 | | 435 | 440 445 |
| | Arg His Arg Val Pro Lys Gly Ser Ala Asp Val Ile Lys Val Met | | |
| | Tyr | | |
| 25 | | 450 | 455 460 |
| | Ser Ala Val Ala Leu Leu Asn His Ser Met Glu Lys Asn Asn Ile | | |
| | Glu | | |
| 30 | | 465 | 470 475 |
| | 480 | | |
| | Arg Arg Ile Lys Ala Pro Ser Met Pro Leu Phe Val Asn Cys Asp | | |
| | Glu | | |
| 35 | | 485 | 490 495 |
| | Leu Gly Leu Glu Gln Ile Phe Ser Asn Leu Ile Ser Asn Ala Leu | | |
| | Asp | | |
| 40 | | 500 | 505 510 |
| | Ser Met Glu Gly Ser Ser Tyr Lys Arg Leu Asp Ile Ala Ile Arg | | |
| | Gln | | |
| 45 | | 515 | 520 525 |
| | Ala Asn Asn Lys Val Ile Ile Thr Ile Lys Asp Ser Gly Gly Gly | | |
| | Phe | | |
| 50 | | 530 | 535 540 |

Ala Pro Glu Val Val Asp Arg Ile Phe Glu Pro Phe Phe Thr Thr
 Lys
 5 545 550 555
 560

Arg Arg Gly Met Gly Leu Gly Leu Ala Ile Val Ser Glu Ile Val
 Arg
 10 565 570 575

Asn Ser Asn Gly Ala Leu His Ala Ser Asn His Pro Glu Gly Gly
 Ala
 15 580 585 590

Val Met Thr Leu Thr Trp Pro Glu Trp Gly Glu Glu His Glu
 20 595 600 605

<210> 22 <211> 101 <212> PRT <213> Escherichia coli <400>
 22

Val Leu Thr Pro Gln His Leu Arg Cys Val Leu Thr Cys Ser Asp
 Leu
 25 1 5 10 15

Leu Thr Leu Leu Ser Gly Thr Val Met Ser Gln Met Pro Leu Tyr
 Phe
 30 20 25 30

Leu Asn Thr Gln Lys Lys Leu Thr Ala His Tyr Glu Trp Leu Gln
 Ile
 35 35 40 45

Asn Leu Thr Asp Thr Tyr Glu Leu Val Lys Arg Leu Met Pro Ile
 Pro
 40 50 55 60

Ser Leu Asp Val Val Val Lys Val Gly Lys Leu Val Leu Pro Glu
 Lys
 45 65 70 75 80

50

Gly His His Gly Phe Tyr Pro Glu Ala Gly Val Val Tyr Arg Thr
 Val
 85 90 95

5
 Ala Pro Glu Asn Pro
 100

10 <210> 23 <211> 263 <212> PRT <213> Escherichia coli <400>
 23

Met Met Lys Asn Thr Gly Tyr Ile Leu Ala Leu Cys Leu Thr Ala
 Ser
 15 1 5 10 15

Gly His Val Leu Ala His Asp Val Trp Ile Thr Gly Lys Gln Ala
 Glu
 20 20 25 30

Asn Asn Val Thr Ala Glu Ile Gly Tyr Gly His Asn Phe Pro Ser
 Lys
 25 35 40 45

Gly Thr Ile Pro Asp Arg Arg Asp Phe Phe Glu Asn Pro Arg Leu
 Tyr
 30 50 55 60

Asn Gly Lys Glu Thr Ile Thr Leu Lys Pro Ala Ser Thr Asp Tyr
 Val
 35 65 70 75 80

Tyr Lys Thr Glu Ser Ala Ser Lys Asp Asn Gly Tyr Val Leu Ser
 Thr
 40 85 90 95

Tyr Met Lys Pro Gly Tyr Trp Ser Arg Thr Ser Ser Gly Trp Lys
 Pro
 45 100 105 110

Val Ser Arg Glu Gly Arg Asn Asp Val Ala Tyr Cys Glu Phe Val
 Thr
 50 115 120 125

Lys Tyr Ala Lys Ser Phe Ile Pro Gly Glu Gln Gln Met Pro Ala
 Gln
 130 135 140
 5

Leu Tyr Gln Ser Pro Thr Gly His Glu Leu Glu Ile Ile Pro Leu
 Ser
 145 150 155
 10 160

Asp Ile Ser Arg Phe Ser Glu Asn Val Lys Leu Lys Val Leu Tyr
 Lys
 15 165 170 175

Thr Ser Pro Leu Ala Gly Ala Ile Met Glu Leu Asp Ser Val Ser
 Tyr
 20 180 185 190

Leu Thr Ser Ser Arg His Thr His Ala Val Glu His Lys His Pro
 Val
 25 195 200 205

His Lys Ala Glu Leu Thr Phe Val Thr Asn Glu Asp Gly Ile Val
 Thr
 30 210 215 220

Val Pro Ser Leu His Ile Gly Gln Trp Leu Ala Lys Val Gln Asn
 Lys
 35 225 230 235
 240

Lys Ser Phe Gln Asp Lys Ser Leu Cys Asp Glu Thr Val Asp Val
 Ala
 40 245 250 255

Thr Leu Ser Phe Ser Arg Asn
 45 260

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 50

Met Gly Lys Ile Lys Tyr Trp Leu Ile Val Gly Phe Ile Ile Leu
 Phe
 1 5 10 15

5
 Ala Ile Phe Tyr Ile Ala Ile Ser Asp Arg Asp Ser Thr Leu Ser
 Arg
 20 25 30

10
 Leu Lys Ser Ala Gly Glu Asn Gly Asp Val Glu Ala Gln Tyr Ala
 Leu
 35 40 45

15
 Gly Leu Met Tyr Leu Tyr Gly Glu Ile Leu Asp Val Asp Tyr Gln
 Gln
 50 55 60

20
 Ala Lys Ile Trp Tyr Glu Lys Ala Ala Asp Gln Asn Asp Pro Arg
 Ala
 65 70 75 80

25
 Gln Ala Lys Leu Gly Val Met Tyr Ala Asn Gly Leu Gly Val Asn
 Gln
 85 90 95

30
 Asp Tyr Gln Gln Ser Lys Leu Trp Tyr Glu Lys Ala Ala Ala Gln
 Asn
 100 105 110

35
 Asp Val Asp Ala Gln Phe Leu Leu Gly Glu Met Tyr Asp Asp Gly
 Leu
 115 120 125

40
 Gly Val Ser Gln Asp Tyr Gln His Ala Lys Met Trp Tyr Glu Lys
 Ala
 130 135 140

45
 Ala Ala Gln Asn Asp Glu Arg Ala Gln Val Asn Leu Ala Val Leu
 Tyr
 145 150 155
 160

50

| | | | |
|----|-------------------------------------------------------------|-----|---------|
| | Ala Lys Gly Asn Gly Val Glu Gln Asp Tyr Arg Gln Ala Lys Ser | | |
| | Trp | | |
| | | 165 | 170 175 |
| 5 | Tyr Glu Lys Ala Ala Ala Gln Asn Ser Pro Asp Ala Gln Phe Ala | | |
| | Leu | 180 | 185 190 |
| 10 | Gly Ile Leu Tyr Ala Asn Ala Asn Gly Val Glu Gln Asp Tyr Gln | | |
| | Gln | 195 | 200 205 |
| 15 | Ala Lys Asp Trp Tyr Glu Lys Ala Ala Glu Gln Asn Phe Ala Asn | | |
| | Ala | 210 | 215 220 |
| 20 | Gln Phe Asn Leu Gly Met Leu Tyr Tyr Lys Gly Glu Gly Val Lys | | |
| | Gln | 225 | 230 235 |
| | | 240 | |
| 25 | Asn Phe Arg Gln Ala Arg Glu Trp Phe Glu Lys Ala Ala Ser Gln | | |
| | Asn | 245 | 250 255 |
| 30 | Gln Pro Asn Ala Gln Tyr Asn Leu Gly Gln Ile Tyr Tyr Tyr Gly | | |
| | Gln | 260 | 265 270 |
| 35 | Gly Val Thr Gln Ser Tyr Arg Gln Ala Lys Asp Trp Phe Glu Lys | | |
| | Ala | 275 | 280 285 |
| 40 | Ala Glu Lys Gly His Val Asp Ala Gln Tyr Asn Leu Gly Val Ile | | |
| | Tyr | 290 | 295 300 |
| 45 | Glu Asn Gly Glu Gly Val Ser Gln Asn Tyr Gln Gln Ala Lys Ala | | |
| | Trp | 305 | 310 315 |
| 50 | | 320 | |

Tyr Glu Lys Ala Ala Ser Gln Asn Asp Ala Gln Ala Gln Phe Glu
 Leu
 325 330 335
 5

Gly Val Met Asn Glu Leu Gly Gln Gly Glu Ser Ile Asp Leu Lys
 Gln
 340 345 350
 10

Ala Arg His Tyr Tyr Glu Arg Ser Cys Asn Asn Gly Leu Lys Lys
 Gly
 355 360 365
 15

Cys Glu Arg Leu Lys Glu Leu Leu Tyr Lys
 370 375
 20

<210> 25 <211> 654 <212> PRT <213> Escherichia coli <400>
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Met Asn Val Ile Arg Thr Val Ile Cys Thr Leu Ile Ile Leu Pro
 Val
 1 5 10 15
 25

Gly Leu Gln Ala Ala Thr Ser His Ser Ser Met Val Lys Asp Thr
 Ile
 20 25 30
 30

Thr Ile Val Ala Thr Gly Asn Gln Asn Thr Val Phe Glu Thr Pro
 Ser
 35 40 45
 35

Met Val Ser Val Val Thr Asn Asp Thr Pro Trp Ser Gln Asn Ala
 Val
 50 55 60
 40

Thr Ser Ala Gly Met Leu Lys Gly Val Ala Gly Leu Ser Gln Thr
 Gly
 65 70 75 80
 45

Ala Gly Arg Thr Asn Gly Gln Thr Phe Asn Leu Arg Gly Tyr Asp
 Lys
 85 90 95
 50

| | | | | |
|----|----------------------------------------------------------------------------------|-----|-----|-----|
| 5 | Ser Gly Val Leu Val Leu Val Asp Gly Val Arg Gln Leu Ser Asp Met | 100 | 105 | 110 |
| 10 | Ala Lys Ser Ser Gly Thr Tyr Leu Asp Pro Ala Leu Val Lys Arg Ile | 115 | 120 | 125 |
| 15 | Glu Val Val Arg Gly Pro Asn Ser Ser Leu Tyr Gly Ser Gly Gly Leu | 130 | 135 | 140 |
| 20 | Gly Gly Val Val Asp Phe Arg Thr Ala Asp Ala Ala Asp Phe Leu Pro 145 160 | 150 | 155 | |
| 25 | Pro Gly Glu Thr Asn Gly Leu Ser Leu Trp Gly Asn Ile Ala Ser Gly | 165 | 170 | 175 |
| 30 | Asp His Ser Thr Gly Ser Gly Leu Thr Trp Phe Gly Lys Thr Gly Lys | 180 | 185 | 190 |
| 35 | Thr Asp Ala Leu Leu Ser Val Ile Met Arg Lys Arg Gly Asn Ile Tyr | 195 | 200 | 205 |
| 40 | Gln Ser Asp Gly Glu His Ala Pro Asn Lys Glu Lys Pro Ala Ala Leu | 210 | 215 | 220 |
| 45 | Phe Ala Lys Gly Ser Val Gly Ile Thr Asp Ser Asn Lys Ala Gly Ala 225 240 | 230 | 235 | |
| 50 | Ser Leu Arg Leu Tyr Arg Asn Asn Thr Thr Glu Pro Gly Asn Ser Thr | | | |

| | | | | | | |
|----|----------------------------------------------------------------------------------|-----|-----|-----|-----|-----|
| | | 245 | | 250 | | 255 |
| 5 | Gln Thr His Gly Asp Ser Gly Leu Arg Asp Arg Lys Thr Val Gln Asn | 260 | | 265 | | 270 |
| 10 | Asp Val Gln Phe Trp Tyr Gln Tyr Ala Pro Val Asp Asn Ser Leu Ile | 275 | | 280 | | 285 |
| 15 | Asn Val Lys Ser Thr Leu Tyr Leu Ser Asp Ile Thr Ile Lys Thr Asn | 290 | | 295 | | 300 |
| 20 | Gly His Asn Lys Thr Ala Glu Trp Arg Asn Asn Arg Thr Ser Gly Val 305 320 | | 310 | | 315 | |
| 25 | Asn Val Val Asn Arg Ser His Thr Leu Ile Phe Pro Gly Ala His Gln | | 325 | | 330 | 335 |
| 30 | Leu Ser Tyr Gly Ala Glu Tyr Tyr Arg Gln Gln Gln Lys Pro Glu Gly | | 340 | | 345 | 350 |
| 35 | Ser Ala Thr Leu Tyr Pro Glu Gly Asn Ile Asp Phe Thr Ser Leu Tyr | | 355 | | 360 | 365 |
| 40 | Phe Gln Asp Glu Met Thr Met Lys Ser Tyr Pro Val Asn Ile Ile Val | | 370 | | 375 | 380 |
| 45 | Gly Ser Arg Tyr Asp Arg Tyr Lys Ser Phe Asn Pro Arg Ala Gly Glu 385 400 | | 390 | | 395 | |
| 50 | | | | | | |

Leu Lys Ala Glu Arg Leu Ser Pro Arg Ala Ala Ile Ser Val Ser
 Pro
 405 410 415

5 Thr Asp Trp Leu Met Met Tyr Gly Ser Ile Ser Ser Ala Phe Arg
 Ala
 420 425 430

10 Pro Thr Met Ala Glu Met Tyr Arg Asp Asp Val His Phe Tyr Arg
 Lys
 435 440 445

15 Gly Lys Pro Asn Tyr Trp Val Pro Asn Leu Asn Leu Lys Pro Glu
 Asn
 450 455 460

20 Asn Ile Thr Arg Glu Ile Gly Ala Gly Ile Gln Leu Asp Gly Leu
 Leu
 465 470 475
 480

25 Thr Asp Asn Asp Arg Leu Gln Leu Lys Gly Gly Tyr Phe Gly Thr
 Asp
 485 490 495

30 Ala Arg Asn Tyr Ile Ala Thr Arg Val Asp Met Lys Arg Met Arg
 Ser
 500 505 510

35 Tyr Ser Tyr Asn Val Ser Arg Ala Arg Ile Trp Gly Trp Asp Met
 Gln
 515 520 525

40 Gly Asn Tyr Gln Ser Asp Tyr Val Asp Trp Met Leu Ser Tyr Asn
 Arg
 530 535 540

45 Thr Glu Ser Met Asp Ala Ser Ser Arg Glu Trp Leu Gly Ser Gly
 Asn
 545 550 555
 560

Pro Asp Thr Leu Ile Ser Asp Ile Ser Ile Pro Val Gly His Arg
 Gly
 565 570 575
 5

Val Tyr Ala Gly Trp Arg Ala Glu Leu Ser Ala Ser Ala Thr His
 Val
 580 585 590
 10

Lys Lys Gly Asp Pro His Gln Ala Gly Tyr Thr Ile His Ser Phe
 Ser
 595 600 605
 15

Leu Ser Tyr Lys Pro Val Ser Val Lys Gly Phe Glu Ala Ser Val
 Thr
 610 615 620
 20

Leu Asp Asn Ala Phe Asn Lys Leu Ala Met Asn Gly Lys Gly Val
 Pro
 625 630 635
 25 640

Leu Ser Gly Arg Thr Val Ser Leu Tyr Thr Arg Tyr Gln Trp
 645 650
 30

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35 Met Asn Lys Ile Tyr Ala Leu Lys Tyr Cys Tyr Ile Thr Asn Thr
 Val
 1 5 10 15

40 Lys Val Val Ser Glu Leu Ala Arg Arg Val Cys Lys Gly Ser Thr
 Arg
 20 25 30

45 Arg Gly Lys Arg Leu Ser Val Leu Thr Ser Leu Ala Leu Ser Ala
 Leu
 35 40 45

50 Leu Pro Thr Val Ala Gly Ala Ser Thr Val Gly Gly Asn Asn Pro
 Tyr

| | 50 | 55 | 60 |
|----|----------------------------------------------------------------------------------|-----|-------|
| 5 | Gln Thr Tyr Arg Asp Phe Ala Glu Asn Lys Gly Gln Phe Gln Ala Gly 65 | 70 | 75 80 |
| 10 | Ala Thr Asn Ile Pro Ile Phe Asn Asn Lys Gly Glu Leu Val Gly His 85 | 90 | 95 |
| 15 | Leu Asp Lys Ala Pro Met Val Asp Phe Ser Ser Val Asn Val Ser Ser 100 | 105 | 110 |
| 20 | Asn Pro Gly Val Ala Thr Leu Ile Asn Pro Gln Tyr Ile Ala Ser Val 115 | 120 | 125 |
| 25 | Lys His Asn Lys Gly Tyr Gln Ser Val Ser Phe Gly Asp Gly Gln Asn 130 | 135 | 140 |
| 30 | Ser Tyr His Ile Val Asp Arg Asn Glu His Ser Ser Ser Asp Leu His 145 160 | 150 | 155 |
| 35 | Thr Pro Arg Leu Asp Lys Leu Val Thr Glu Val Ala Pro Ala Thr Val 165 | 170 | 175 |
| 40 | Thr Ser Ser Ser Thr Ala Asp Ile Leu Asn Pro Ser Lys Tyr Ser Ala 180 | 185 | 190 |
| 45 | Phe Tyr Arg Ala Gly Ser Gly Ser Gln Tyr Ile Gln Asp Ser Gln Gly 195 | 200 | 205 |
| 50 | Lys Arg His Trp Val Thr Gly Gly Tyr Gly Tyr Leu Thr Gly Gly Ile | | |

| | 210 | 215 | 220 |
|----|------------------------------------------------------------------------------------|-----|---------|
| 5 | Leu Pro Thr Ser Phe Phe Tyr His Gly Ser Asp Gly Ile Gln Leu Tyr 2 25 2 40 | 230 | 235 |
| 10 | Met Gly Gly Asn Ile His Asp His Ser Ile Leu Pro Ser Phe Gly Glu | 245 | 250 255 |
| 15 | Ala Gly Asp Ser Gly Ser Pro Leu Phe Gly Trp Asn Thr Ala Lys Gly | 260 | 265 270 |
| 20 | Gln Trp Glu Leu Val Gly Val Tyr Ser Gly Val Gly Gly Gly Thr Asn | 275 | 280 285 |
| 25 | Leu Ile Tyr Ser Leu Ile Pro Gln Ser Phe Leu Ser Gln Ile Tyr Ser | 290 | 295 300 |
| 30 | Glu Asp Asn Asp Ala Pro Val Phe Phe Asn Ala Ser Ser Gly Ala Pro 305 320 | 310 | 315 |
| 35 | Leu Gln Trp Lys Phe Asp Ser Ser Thr Gly Thr Gly Ser Leu Lys Gln | 325 | 330 335 |
| 40 | Gly Ser Asp Glu Tyr Ala Met His Gly Gln Lys Gly Ser Asp Leu Asn | 340 | 345 350 |
| 45 | Ala Gly Lys Asn Leu Thr Phe Leu Gly His Asn Gly Gln Ile Asp Leu | 355 | 360 365 |
| 50 | | | |

76/370

Glu Asn Ser Val Thr Gln Gly Ala Gly Ser Leu Thr Phe Thr Asp
Asp
370 375 380

5 Tyr Thr Val Thr Thr Ser Asn Gly Ser Thr Trp Thr Gly Ala Gly
Ile
385 390 395
400

10

Ile Val Asp Lys Asp Ala Ser Val Asn Trp Gln Val Asn Gly Val
Lys

405 410 415

15

Gly Asp Asn Leu His Lys Ile Gly Glu Gly Thr Leu Val Val Gln
Gly

420 425 430

20

Thr Gly Val Asn Glu Gly Gly Leu Lys Val Gly Asp Gly Thr Val
Val

435 440 445

25

Leu Asn Gln Gln Ala Asp Ser Ser Gly His Val Gln Ala Phe Ser
Ser

450 455 460

```

30      Val Asn Ile Ala Ser Gly Arg Pro Thr Val Val Leu Ala Asp Asn
      Gln
      465              470              475
35      480

```

Gln Val Asn Pro Asp Asn Ile Ser Trp Gly Tyr Arg Gly Gly Val
Leu
40 485 490 495

Asp Val Asn Gly Asn Asp Leu Thr Phe His Lys Leu Asn Ala Ala
Asp
45 500 505 510

Tyr Gly Ala Thr Leu Gly Asn Ser Ser Asp Lys Thr Ala Asn Ile
Thr
50 515 520 525

| | | |
|----|-------------------------------------------------------------|--|
| | Leu Asp Tyr Gln Thr Arg Pro Ala Asp Val Lys Val Asn Glu Trp | |
| | Ser | |
| 5 | 530 535 540 | |
| | Ser Ser Asn Arg Gly Thr Val Gly Ser Leu Tyr Ile Tyr Asn Asn | |
| | Pro | |
| 10 | 545 550 555 | |
| | 560 | |
| | Tyr Thr His Thr Val Asp Tyr Phe Ile Leu Lys Thr Ser Ser Tyr | |
| 15 | Gly 565 570 575 | |
| | Trp Phe Pro Thr Gly Gln Val Ser Asn Glu His Trp Glu Tyr Val | |
| 20 | Gly 580 585 590 | |
| | His Asp Gln Asn Ser Ala Gln Ala Leu Leu Ala Asn Arg Ile Asn | |
| 25 | Asn 595 600 605 | |
| | Lys Gly Tyr Leu Tyr His Gly Lys Leu Leu Gly Asn Ile Asn Phe | |
| 30 | Ser 610 615 620 | |
| | Asn Lys Ala Thr Pro Gly Thr Thr Gly Ala Leu Val Met Asp Gly | |
| 35 | Ser 625 630 635 | |
| | 640 | |
| | Ala Asn Met Ser Gly Thr Phe Thr Gln Glu Asn Gly Arg Leu Thr | |
| 40 | Ile 645 650 655 | |
| | Gln Gly His Pro Val Ile His Ala Ser Thr Ser Gln Ser Ile Ala | |
| 45 | Asn 660 665 670 | |
| | Thr Val Ser Ser Leu Gly Asp Asn Ser Val Leu Thr Gln Pro Thr | |
| 50 | Ser 675 680 685 | |

| | | | | |
|----|--------------------------------------------------------------------|------------|-----|-----|
| 5 | Phe Thr Gln Asp Asp Trp Glu Asn Arg Thr Phe Ser Phe Gly Ser Leu | 690 | 695 | 700 |
| 10 | Val Leu Lys Asp Thr Asp Phe Gly Leu Gly Arg Asn Ala Thr Leu Asn | 705 720 | 710 | 715 |
| 15 | Thr Thr Ile Gln Ala Asp Asn Ser Ser Val Thr Leu Gly Asp Ser Arg | 725 | 730 | 735 |
| 20 | Val Phe Ile Asp Lys Lys Asp Gly Gln Gly Thr Ala Phe Thr Leu Glu | 740 | 745 | 750 |
| 25 | Glu Gly Thr Ser Val Ala Thr Lys Asp Ala Asp Lys Ser Val Phe Asn | 755 | 760 | 765 |
| 30 | Gly Thr Val Asn Leu Asp Asn Gln Ser Val Leu Asn Ile Asn Glu Ile | 770 | 775 | 780 |
| 35 | Phe Asn Gly Gly Ile Gln Ala Asn Asn Ser Thr Val Asn Ile Ser Ser | 785 800 | 790 | 795 |
| 40 | Asp Ser Ala Val Leu Glu Asn Ser Thr Leu Thr Ser Thr Ala Leu Asn | 805 | 810 | 815 |
| 45 | Leu Asn Lys Gly Ala Asn Val Leu Ala Ser Gln Ser Phe Val Ser Asp | 820 | 825 | 830 |
| 50 | Gly Pro Val Asn Ile Ser Asp Ala Thr Leu Ser Leu Asn Ser Arg Pro | | | |

835

840

845

| | | | | |
|----|--------------------------------------------------------------------|------------|-----|-----|
| 5 | Asp Glu Val Ser His Thr Leu Leu Pro Val Tyr Asp Tyr Ala Gly Ser | 850 | 855 | 860 |
| 10 | Trp Asn Leu Lys Gly Asp Asp Ala Arg Leu Asn Val Gly Pro Tyr Ser | 865 880 | 870 | 875 |
| 15 | Met Leu Ser Gly Asn Ile Asn Val Gln Asp Lys Gly Thr Val Thr Leu | 885 | 890 | 895 |
| 20 | Gly Gly Glu Gly Glu Leu Ser Pro Asp Leu Thr Leu Gln Asn Gln Met | 900 | 905 | 910 |
| 25 | Leu Tyr Ser Leu Phe Asn Gly Tyr Arg Asn Thr Trp Ser Gly Ser Leu | 915 | 920 | 925 |
| 30 | Asn Ala Pro Asp Ala Thr Val Ser Met Thr Asp Thr Gln Trp Ser Met | 930 | 935 | 940 |
| 35 | Asn Gly Asn Ser Thr Ala Gly Asn Met Lys Leu Asn Arg Thr Ile Val | 945 960 | 950 | 955 |
| 40 | Gly Phe Asn Gly Gly Thr Ser Ser Phe Thr Thr Leu Thr Thr Asp Asn | 965 | 970 | 975 |
| 45 | Leu Asp Ala Val Gln Ser Ala Phe Val Met Arg Thr Asp Leu Asn Lys | 980 | 985 | 990 |

50

| | | | | | | | | | | | | | | | |
|----|------|-----|-----|-----|-----|-----|------|------|-----|-----|-----|------|-----|------|-----|
| | Ala | Asp | Lys | Leu | Val | Ile | Asn | Lys | Ser | Ala | Thr | Gly | His | Asp | Asn |
| | Ser | | | | | | | | | | | | | | |
| | | | 995 | | | | | 1000 | | | | | | 1005 | |
| 5 | Ile | Trp | Val | Asn | Phe | Leu | Lys | Lys | Pro | Ser | Asp | Lys | Asp | Thr | Leu |
| | 1010 | | | | | | 1015 | | | | | 1020 | | | |
| 10 | Asp | Ile | Pro | Leu | Val | Ser | Ala | Pro | Glu | Ala | Thr | Ala | Asp | Asn | Leu |
| | 1025 | | | | | | 1030 | | | | | 1035 | | | |
| 15 | Phe | Arg | Ala | Ser | Thr | Arg | Val | Val | Gly | Phe | Ser | Asp | Val | Thr | Pro |
| | 1040 | | | | | | 1045 | | | | | 1050 | | | |
| 20 | Thr | Leu | Ser | Val | Arg | Lys | Glu | Asp | Gly | Lys | Lys | Glu | Trp | Val | Leu |
| | 1055 | | | | | | 1060 | | | | | 1065 | | | |
| 25 | Asp | Gly | Tyr | Gln | Val | Ala | Arg | Asn | Asp | Gly | Gln | Gly | Lys | Ala | Ala |
| | 1070 | | | | | | 1075 | | | | | 1080 | | | |
| 30 | Ala | Thr | Phe | Met | His | Ile | Ser | Tyr | Asn | Asn | Phe | Ile | Thr | Glu | Val |
| | 1085 | | | | | | 1090 | | | | | 1095 | | | |
| 35 | Asn | Asn | Leu | Asn | Lys | Arg | Met | Gly | Asp | Leu | Arg | Asp | Ile | Asn | Gly |
| | 1100 | | | | | | 1105 | | | | | 1110 | | | |
| 40 | Glu | Ala | Gly | Thr | Trp | Val | Arg | Leu | Leu | Asn | Gly | Ser | Gly | Ser | Ala |
| | 1115 | | | | | | 1120 | | | | | 1125 | | | |
| 45 | Asp | Gly | Gly | Phe | Thr | Asp | His | Tyr | Thr | Leu | Leu | Gln | Met | Gly | Ala |
| | 1130 | | | | | | 1135 | | | | | 1140 | | | |
| 50 | Asp | Arg | Lys | His | Glu | Leu | Gly | Ser | Met | Asp | Leu | Phe | Thr | Gly | Val |
| | 1145 | | | | | | 1150 | | | | | 1155 | | | |
| 55 | Met | Ala | Thr | Tyr | Thr | Asp | Thr | Asp | Ala | Ser | Ala | Gly | Leu | Tyr | Ser |
| | 1160 | | | | | | 1165 | | | | | 1170 | | | |
| 60 | Gly | Lys | Thr | Lys | Ser | Trp | Gly | Gly | Gly | Phe | Tyr | Ala | Ser | Gly | Leu |
| | 1175 | | | | | | 1180 | | | | | 1185 | | | |

5 Phe Arg Ser Gly Ala Tyr Phe Asp Leu Ile Ala Lys Tyr Ile His
 1190 1195 1200

10 Asn Glu Asn Lys Tyr Asp Leu Asn Phe Ala Gly Ala Gly Lys Gln
 1205 1210 1215

15 Asn Phe Arg Ser His Ser Leu Tyr Ala Gly Ala Glu Val Gly Tyr
 1220 1225 1230

20 Arg Tyr His Leu Thr Asp Thr Thr Phe Val Glu Pro Gln Ala Glu
 1235 1240 1245

25 Leu Val Trp Gly Arg Leu Gln Gly Gln Thr Phe Asn Trp Asn Asp
 1250 1255 1260

30 Ser Gly Met Asp Val Ser Met Arg Arg Asn Ser Val Asn Pro Leu
 1265 1270 1275

35 Val Gly Arg Thr Gly Val Val Ser Gly Lys Thr Phe Ser Gly Lys
 1280 1285 1290

40 Asp Trp Ser Leu Thr Ala Arg Ala Gly Leu His Tyr Glu Phe Asp
 1295 1300 1305

45 Leu Thr Asp Ser Ala Asp Val His Leu Lys Asp Ala Ala Gly Glu
 1310 1315 1320

50 His Gln Ile Asn Gly Arg Lys Asp Gly Arg Met Leu Tyr Gly Val
 1325 1330 1335

Gly Leu Asn Ala Arg Phe Gly Asp Asn Thr Arg Leu Gly Leu Glu
 1340 1345 1350

Val Glu Arg Ser Ala Phe Gly Lys Tyr Asn Thr Asp Asp Ala Ile
 1355 1360 1365

Asn Ala Asn Ile Arg Tyr Ser Phe

1370

1375

5 <210> 27 <211> 349 <212> PRT <213> Escherichia coli <400>
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 Met Ile Thr Leu Phe Arg Leu Leu Ala Ile Leu Cys Leu Phe Phe
 Asn
 1 5 10 15
 10
 Val Ser Ala Phe Ala Val Asp Cys Tyr Gln Asp Gly Tyr Arg Gly
 Thr
 20 25 30
 15
 Thr Leu Ile Asn Gly Asp Leu Pro Thr Phe Lys Ile Pro Glu Asn
 Ala
 35 40 45
 20
 Gln Pro Gly Gln Lys Ile Trp Glu Ser Gly Asp Ile Asn Ile Thr
 Val
 50 55 60
 25
 Tyr Cys Asp Asn Ala Pro Gly Trp Ser Ser Asn Asn Pro Ser Glu
 Asn
 65 70 75 80
 30
 Val Tyr Ala Trp Ile Lys Leu Pro Gln Ile Asn Ser Ala Asp Met
 Leu
 85 90 95
 35
 Asn Asn Pro Tyr Leu Thr Phe Gly Val Thr Tyr Asn Gly Val Asp
 Tyr
 100 105 110
 40
 Glu Gly Thr Asn Glu Lys Ile Asp Thr His Ala Cys Leu Asp Lys
 Tyr
 115 120 125
 45
 Glu Gln Tyr Tyr Asn Gly Tyr Tyr His Asp Pro Val Cys Asn Gly
 Ser
 130 135 140
 50

| | Thr | Leu | Gln | Lys | Asn | Val | Thr | Phe | Asn | Ala | His | Phe | Arg | Val | Tyr |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 5 | Val | | | | | | | | | | | | | | |
| | 145 | | | | | 150 | | | | | 155 | | | | |
| | 160 | | | | | | | | | | | | | | |
| 10 | Lys | Phe | Lys | Ser | Arg | Pro | Ala | Gly | Asp | Gln | Thr | Val | Asn | Phe | Gly |
| | Thr | | | | | | | | | | | | | | |
| | | | | | 165 | | | | | 170 | | | | | 175 |
| 15 | Val | Asn | Val | Leu | Gln | Phe | Asp | Gly | Glu | Gly | Gly | Ala | Asn | Met | Ala |
| | Pro | | | | | | | | | | | | | | |
| | | | | 180 | | | | | 185 | | | | | 190 | |
| 20 | Asn | Ala | Lys | Asn | Leu | Arg | Tyr | Ala | Ile | Thr | Gly | Leu | Asp | Asn | Ile |
| | Ser | | | | | | | | | | | | | | |
| | | | 195 | | | | | 200 | | | | | 205 | | |
| 25 | Phe | Leu | Asp | Cys | Ser | Val | Asp | Val | Arg | Ile | Ser | Pro | Glu | Ser | Gln |
| | Ile | | | | | | | | | | | | | | |
| | | 210 | | | | | 215 | | | | | 220 | | | |
| 30 | Val | Asn | Phe | Gly | Gln | Ile | Ala | Ala | Asn | Ser | Ile | Ala | Thr | Phe | Pro |
| | Pro | | | | | | | | | | | | | | |
| | 225 | | | | | 230 | | | | | 235 | | | | |
| | 240 | | | | | | | | | | | | | | |
| 35 | Lys | Ala | Ala | Phe | Ser | Val | Ser | Thr | Ile | Lys | Asp | Ile | Ala | Ser | Asp |
| | Cys | | | | | | | | | | | | | | |
| | | | | | 245 | | | | | 250 | | | | | 255 |
| 40 | Thr | Glu | Gln | Phe | Asp | Val | Ala | Thr | Ser | Phe | Phe | Thr | Ser | Asp | Thr |
| | Leu | | | | | | | | | | | | | | |
| | | | | 260 | | | | | 265 | | | | | 270 | |
| 45 | Tyr | Asp | Asn | Thr | His | Leu | Glu | Ile | Gly | Asn | Gly | Leu | Leu | Met | Arg |
| | Ile | | | | | | | | | | | | | | |
| | | | 275 | | | | | 280 | | | | | 285 | | |
| 50 | Thr | Asp | Gln | Lys | Thr | Gln | Glu | Asp | Ile | Lys | Phe | Asn | Gln | Phe | Lys |
| | Leu | | | | | | | | | | | | | | |
| | | 290 | | | | | 295 | | | | | 300 | | | |

Phe Ser Thr Tyr Ile Pro Gly Gln Ser Ala Ala Met Ala Thr Arg
 Asp
 305 310 315
 5 320

Tyr Gln Ala Glu Leu Thr Gln Lys Pro Gly Glu Pro Leu Val Tyr
 Gly
 10 325 330 335

Pro Phe Gln Lys Asp Leu Ile Val Lys Ile Asn Tyr His
 340 345
 15

<210> 28 <211> 840 <212> PRT <213> Escherichia coli <400>
 28

20 Met Asn Asn Lys Asn Thr Phe Ser Arg Asp Lys Leu Ser His Ala
 Ile
 1 5 10 15

25 Lys Asn Ala Leu Ser Gly Val Val Cys Ser Leu Leu Phe Val Leu
 Pro
 20 25 30

30 Val His Ala Val Glu Phe Asn Val Asp Met Ile Asp Ala Glu Asp
 Arg
 35 40 45

35 Glu Asn Ile Asp Ile Ser Arg Phe Glu Lys Lys Gly Tyr Ile Pro
 Pro
 50 55 60

40 Gly Arg Tyr Leu Val Arg Val Gln Ile Asn Lys Asn Met Leu Pro
 Gln
 65 70 75 80

45 Thr Leu Ile Leu Glu Trp Val Lys Ala Asp Asn Glu Ser Gly Ser
 Leu
 85 90 95

50 Leu Cys Leu Thr Lys Glu Asn Leu Thr Asn Phe Gly Leu Asn Thr
 Glu

| | 100 | 105 | 110 |
|----|--------------------------------------------------------------------|---------|---------|
| 5 | Phe Ile Glu Ser Leu Gln Asn Ile Ala Gly Ser Glu Cys Leu Asp Leu | 115 | 120 125 |
| 10 | Ser Gln Arg Gln Glu Leu Thr Thr Arg Leu Asp Lys Ala Thr Met Ile | 130 | 135 140 |
| 15 | Leu Ser Leu Ser Val Pro Gln Ala Trp Leu Lys Tyr Gln Ala Thr Asn | 145 150 | 155 160 |
| 20 | Trp Thr Pro Pro Glu Phe Trp Asp Thr Gly Ile Thr Gly Phe Ile Leu | 165 | 170 175 |
| 25 | Asp Tyr Asn Val Tyr Ala Ser Gln Tyr Ala Pro His His Gly Asp Ser | 180 | 185 190 |
| 30 | Thr Gln Asn Val Ser Ser Tyr Gly Thr Leu Gly Phe Asn Leu Gly Ala | 195 | 200 205 |
| 35 | Trp Arg Leu Arg Ser Asp Tyr Gln Tyr Asn Gln Asn Phe Ala Asp Gly | 210 | 215 220 |
| 40 | Arg Ser Val Asn Arg Asp Ser Glu Phe Ala Arg Thr Tyr Leu Phe Arg | 225 230 | 235 240 |
| 45 | Pro Ile Pro Ser Trp Ser Ser Lys Phe Thr Met Gly Gln Tyr Asp Leu | 245 | 250 255 |
| 50 | | | |

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| | | | | | | | | | | | | | | | |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | Ser | Ser | Asn | Leu | Tyr | Asp | Thr | Phe | His | Phe | Thr | Gly | Ala | Ser | Leu |
| | Glu | | | | | | | | | | | | | | |
| | | | | 260 | | | | | 265 | | | | | 270 | |
| 5 | Ser | Asp | Glu | Ser | Met | Leu | Pro | Pro | Asp | Leu | Gln | Gly | Tyr | Ala | Pro |
| | Gln | | | | | | | | | | | | | | |
| | | | 275 | | | | | 280 | | | | | 285 | | |
| 10 | Ile | Thr | Gly | Ile | Ala | Gln | Thr | Asn | Ala | Lys | Val | Thr | Val | Ala | Gln |
| | Asn | | | | | | | | | | | | | | |
| | | | 290 | | | | 295 | | | | | 300 | | | |
| 15 | Gly | Arg | Val | Leu | Tyr | Gln | Thr | Thr | Val | Ala | Pro | Gly | Pro | Phe | Thr |
| | Ile | | | | | | | | | | | | | | |
| | 305 | | | | | 310 | | | | | 315 | | | | |
| | 320 | | | | | | | | | | | | | | |
| 20 | Ser | Asp | Leu | Gly | Gln | Ser | Phe | Gln | Gly | Gln | Leu | Asp | Val | Thr | Val |
| | Glu | | | | | | | | | | | | | | |
| | | | | 325 | | | | | 330 | | | | | 335 | |
| 25 | Glu | Glu | Asp | Gly | Arg | Thr | Ser | Thr | Phe | Gln | Val | Gly | Ser | Ala | Ser |
| | Ile | | | | | | | | | | | | | | |
| | | | | 340 | | | | | 345 | | | | | 350 | |
| 30 | Pro | Tyr | Leu | Thr | Arg | Lys | Gly | Gln | Val | Arg | Tyr | Lys | Thr | Ser | Leu |
| | Gly | | | | | | | | | | | | | | |
| | | | 355 | | | | | 360 | | | | | 365 | | |
| 35 | Lys | Pro | Thr | Ser | Val | Gly | His | Asn | Asp | Ile | Asn | Asn | Pro | Phe | Phe |
| | Trp | | | | | | | | | | | | | | |
| | | 370 | | | | | 375 | | | | | 380 | | | |
| 40 | Thr | Ala | Glu | Ala | Ser | Trp | Gly | Trp | Leu | Asn | Asn | Val | Ser | Leu | Tyr |
| | Gly | | | | | | | | | | | | | | |
| | 385 | | | | | 390 | | | | | 395 | | | | |
| 45 | 400 | | | | | | | | | | | | | | |
| 50 | Gly | Gly | Met | Phe | Thr | Ala | Asp | Asp | Tyr | Gln | Ala | Ile | Thr | Thr | Gly |
| | Ile | | | | | | | | | | | | | | |
| | | | | 405 | | | | | 410 | | | | | 415 | |

| | | | | | | | | | | | | | | | | |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| | Gly | Phe | Asn | Leu | Asn | Gln | Phe | Gly | Ser | Leu | Ser | Phe | Asp | Val | Thr | |
| | Gly | | | | | | | | | | | | | | | |
| 5 | | | | 420 | | | | 425 | | | | | 430 | | | |
| | Ala | Asp | Ala | Ser | Leu | Gln | Gln | Gln | Asn | Ser | Gly | Asn | Leu | Arg | Gly | |
| | Tyr | | | 435 | | | | 440 | | | | | 445 | | | |
| 10 | | | | | | | | | | | | | | | | |
| | Ser | Tyr | Arg | Phe | Asn | Tyr | Ala | Lys | His | Phe | Glu | Ser | Thr | Gly | Ser | |
| | Gln | | | | | | | | | | | | | | | |
| 15 | | | | 450 | | | | 455 | | | | | 460 | | | |
| | | | | | | | | | | | | | | | | |
| | Ile | Thr | Phe | Ala | Gly | Tyr | Arg | Phe | Ser | Asp | Lys | Asp | Tyr | Val | Ser | |
| | Met | | | | | | | | | | | | | | | |
| 20 | 465 | | | | | 470 | | | | | | 475 | | | | |
| | 480 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | Ser | Glu | Tyr | Leu | Ser | Ser | Arg | Asn | Gly | Asp | Glu | Ser | Ile | Asp | Asn | |
| | Glu | | | | | | | | | | | | | | | |
| 25 | | | | | 485 | | | | | 490 | | | | 495 | | |
| | | | | | | | | | | | | | | | | |
| | Lys | Glu | Ser | Tyr | Val | Ile | Ser | Leu | Asn | Gln | Tyr | Phe | Glu | Thr | Leu | |
| | Glu | | | | | | | | | | | | | | | |
| 30 | | | | 500 | | | | | | 505 | | | | 510 | | |
| | | | | | | | | | | | | | | | | |
| | Leu | Asn | Ser | Tyr | Leu | Asn | Val | Thr | Arg | Asn | Thr | Tyr | Trp | Asp | Ser | |
| | Ala | | | | | | | | | | | | | | | |
| 35 | | | 515 | | | | | 520 | | | | | 525 | | | |
| | | | | | | | | | | | | | | | | |
| | Ser | Asn | Thr | Asn | Tyr | Ser | Val | Ser | Val | Ser | Lys | Asn | Phe | Asp | Ile | |
| | Gly | | | | | | | | | | | | | | | |
| 40 | | 530 | | | | | | 535 | | | | | 540 | | | |
| | | | | | | | | | | | | | | | | |
| | Asp | Phe | Lys | Gly | Ile | Ser | Ala | Ser | Leu | Ala | Val | Ser | Arg | Ile | Arg | |
| | Trp | | | | | | | | | | | | | | | |
| 45 | 545 | | | | | 550 | | | | | | 555 | | | | |
| | 560 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | Asp | Asp | Asp | Glu | Glu | Asn | Gln | Tyr | Tyr | Phe | Ser | Phe | Ser | Leu | Pro | |
| | Leu | | | | | | | | | | | | | | | |
| 50 | | | | | | | | | | | | | | | | |
| | | | | 565 | | | | | | 570 | | | | 575 | | |

| | | |
|----|-------------------------------------------------------------|---------|
| | Gln Gln Asn Arg Asn Ile Ser Tyr Ser Met Gln Arg Thr Gly Ser | |
| 5 | Ser | |
| | 580 | 585 590 |
| | Asn Thr Ser Gln Met Ile Ser Trp Tyr Asp Ser Ser Asp Arg Asn | |
| 10 | Asn | |
| | 595 | 600 605 |
| | Ile Trp Asn Ile Ser Ala Ser Ala Thr Asp Asp Asn Ile Arg Asp | |
| 15 | Gly | |
| | 610 | 615 620 |
| | Glu Pro Thr Leu Arg Gly Ser Tyr Gln His Tyr Ser Pro Trp Gly | |
| 20 | Arg | |
| | 625 | 630 635 |
| | 640 | |
| | Leu Asn Ile Asn Gly Ser Val Gln Pro Asn Gln Tyr Asn Ser Val | |
| 25 | Thr | |
| | 645 | 650 655 |
| | Ala Gly Trp Tyr Gly Ser Leu Thr Ala Thr Arg His Gly Val Ala | |
| 30 | Leu | |
| | 660 | 665 670 |
| | His Asp Tyr Ser Tyr Gly Asp Asn Ala Arg Met Met Val Asp Thr | |
| 35 | Asp | |
| | 675 | 680 685 |
| | Gly Ile Ser Gly Ile Glu Ile Asn Ser Asn Arg Thr Val Thr Asn | |
| 40 | Gly | |
| | 690 | 695 700 |
| | Leu Gly Ile Ala Val Ile Pro Ser Leu Ser Asn Tyr Thr Thr Ser | |
| 45 | Met | |
| | 705 | 710 715 |
| | 720 | |
| 50 | Leu Arg Val Asn Asn Asn Asp Leu Pro Glu Gly Val Asp Val Glu | |
| | Asn | |

| | 725 | 730 | 735 |
|----|--------------------------------------------------------------------|-----|---------|
| 5 | Ser Val Ile Arg Thr Thr Leu Thr Gln Gly Ala Ile Gly Tyr Ala Lys | 740 | 745 750 |
| 10 | Leu Asn Ala Thr Thr Gly Tyr Gln Ile Val Gly Val Ile Arg Gln Glu | 755 | 760 765 |
| 15 | Asn Gly Arg Phe Pro Pro Leu Gly Val Asn Val Thr Asp Lys Ala Thr | 770 | 775 780 |
| 20 | Gly Lys Asp Val Gly Leu Val Ala Glu Asp Gly Phe Val Tyr Leu Ser | 785 | 790 795 |
| | 800 | | |
| 25 | Gly Ile Gln Glu Asn Ser Ile Leu His Leu Thr Trp Gly Asp Asn Thr | 805 | 810 815 |
| 30 | Cys Glu Val Thr Pro Pro Asn Gln Ser Asn Ile Ser Glu Ser Ala Ile | 820 | 825 830 |
| 35 | Ile Leu Pro Cys Lys Thr Val Lys | 835 | 840 |
| 40 | <210> 29 <211> 169 <212> PRT <213> Escherichia coli <400> 29 | | |
| 45 | Leu Met Asn Thr Lys Gln Ser Val Ala Gln Leu Ala Val Pro His Arg | 1 | 5 10 15 |
| 50 | Lys Arg Leu Ser Ser Thr Met Val Val Ala Leu Leu Leu Cys Val Val | 20 | 25 30 |

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Ala Gly Ala Val Met Ile Asn Ala Ala Asp Phe Pro Ala Thr Ala
Ile
35 40 45

5
Glu Thr Asp Pro Gly Ala Ser Ala Phe Pro Thr Phe Tyr Ala Cys
Ala
50 55 60

10
Leu Ile Val Leu Ala Val Leu Leu Val Ile Arg Asp Leu Leu Gln
Ala
65 70 75 80

15
Lys Pro Ala Ser Cys Ala Asn Ala Gln Glu Lys Pro Ala Phe Arg
Lys
85 90 95

20
Thr Ala Thr Gly Ile Ala Ala Thr Ala Phe Tyr Ile Val Ala Met
Ser
100 105 110

25
Tyr Cys Gly Tyr Leu Ile Thr Thr Pro Val Phe Leu Ile Val Ile
Met
115 120 125

30
Thr Leu Met Gly Tyr Arg Arg Trp Val Leu Thr Pro Gly Ile Ala
Leu
130 135 140

35
Leu Leu Thr Ala Ile Leu Trp Leu Leu Phe Val Glu Ala Leu Gln
Val
145 150 155
160

40
Pro Leu Pro Val Gly Thr Phe Phe Glu
165

45
<210> 30 <211> 311 <212> PRT <213> Escherichia coli <400>
30

50
Met Val Leu Leu Ala Gly Ala Ala Leu Ser Ile Ala Pro Val Gln
Ala
1 5 10 15

| | | | | | | | | | | | | | | | | |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| 5 | Ala | Ser | Tyr | Pro | Thr | Lys | Gln | Ile | Glu | Leu | Val | Val | Pro | Tyr | Ala | |
| | Ala | | | | | | | | | | | | | | | |
| | | | | 20 | | | | | 25 | | | | | 30 | | |
| 10 | Gly | Gly | Gly | Thr | Asp | Leu | Val | Ala | Arg | Ala | Phe | Ala | Asp | Ala | Ala | |
| | Lys | | | | | | | | | | | | | | | |
| | | | 35 | | | | | 40 | | | | | 45 | | | |
| 15 | Asn | His | Leu | Pro | Val | Ser | Ile | Gly | Val | Ile | Asn | Lys | Pro | Gly | Gly | |
| | Gly | | | | | | | | | | | | | | | |
| | | 50 | | | | | | 55 | | | | 60 | | | | |
| 20 | Gly | Ala | Ile | Gly | Leu | Ser | Glu | Ile | Ala | Ala | Ala | Arg | Pro | Asn | Gly | |
| | Tyr | | | | | | | | | | | | | | | |
| | 65 | | | | | 70 | | | | | 75 | | | | 80 | |
| 25 | Lys | Ile | Gly | Leu | Gly | Thr | Val | Glu | Leu | Thr | Thr | Leu | Pro | Ser | Leu | |
| | Gly | | | | | | | | | | | | | | | |
| | | | | | 85 | | | | | 90 | | | | | 95 | |
| 30 | Met | Val | Arg | Phe | Lys | Thr | Ser | Asp | Phe | Lys | Pro | Ile | Ala | Arg | Leu | |
| | Asn | | | | | | | | | | | | | | | |
| | | | | 100 | | | | | 105 | | | | | 110 | | |
| 35 | Ala | Asp | Pro | Ala | Ala | Ile | Thr | Val | Arg | Ala | Asp | Ala | Pro | Trp | Asn | |
| | Ser | | | | | | | | | | | | | | | |
| | | | 115 | | | | | 120 | | | | | 125 | | | |
| 40 | Tyr | Glu | Glu | Phe | Met | Ala | Tyr | Ser | Lys | Ala | Asn | Pro | Gly | Lys | Val | |
| | Arg | | | | | | | | | | | | | | | |
| | | 130 | | | | | | 135 | | | | | 140 | | | |
| 45 | Ile | Gly | Asn | Ser | Gly | Thr | Gly | Ala | Ile | Trp | His | Leu | Ala | Ala | Ala | |
| | Ala | | | | | | | | | | | | | | | |
| | 145 | | | | | 150 | | | | | 155 | | | | | |
| | 160 | | | | | | | | | | | | | | | |
| 50 | Leu | Glu | Asp | Lys | Thr | Gly | Thr | Lys | Phe | Ser | His | Val | Pro | Tyr | Asp | |
| | Gly | | | | | | | | | | | | | | | |
| | | | | | | 165 | | | | 170 | | | | | 175 | |

Ser Val Ser Pro Gly Glu Val Ile Asn His Val Asn Gly Gly Lys
Leu
10 195 200 205

Lys Thr Leu Val Val Met Ala Asp Glu Arg Met Lys Thr Met Pro
Asp
15 210 215 220

```

Val Pro Thr Leu Lys Glu Lys Gly Val Asp Leu Ser Ile Gly Thr
Trp
20      225      230      235
      240

```

25 Arg Gly Leu Ile Val Ser Gln Lys Thr Pro Gln Asp Val Val Asp
Val
245 250 255

30 Leu Ala Lys Ala Ala Lys Glu Thr Ala Glu Glu Pro Ala Phe Gln
 Asp
 260 265 270

35 Ala Leu Gln Lys Leu Asn Leu Asn Tyr Ala Trp Leu Asp Ala Ala
Ser
275 280 285

40 Phe Gln Thr Gln Ile Ser Glu Gln Glu Lys Tyr Phe Asp Glu Leu
Leu
290 295 300

45 Thr Arg Leu Gly Leu Lys Lys
 305 310

50

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<210> 31 <211> 722 <212> PRT <213> Escherichia coli <400>
31
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Met Leu Arg Trp Lys Arg Cys Ile Ile Leu Thr Phe Ile Ser Gly
 Ala
 1 5 10 15
 5
 Ala Phe Ala Ala Pro Glu Ile Asn Val Lys Gln Asn Glu Ser Leu
 Pro
 20 25 30
 10
 Asp Leu Gly Ser Gln Ala Ala Gln Gln Asp Glu Gln Thr Asn Lys
 Gly
 35 40 45
 15
 Lys Ser Leu Lys Glu Arg Gly Ala Asp Tyr Val Ile Asn Ser Ala
 Thr
 50 55 60
 20
 Gln Gly Phe Glu Asn Leu Thr Pro Glu Ala Leu Glu Ser Gln Ala
 Arg
 65 70 75 80
 25
 Ser Tyr Leu Gln Ser Gln Ile Thr Ser Thr Ala Gln Ser Tyr Ile
 Glu
 85 90 95
 30
 Asp Thr Leu Ser Pro Tyr Gly Lys Val Arg Leu Asn Leu Ser Ile
 Gly
 100 105 110
 35
 Gln Gly Gly Asp Leu Asp Gly Ser Ser Ile Asp Tyr Phe Val Pro
 Trp
 115 120 125
 40
 Tyr Asp Asn Gln Thr Thr Val Tyr Phe Ser Gln Phe Ser Ala Gln
 Arg
 130 135 140
 45
 Lys Glu Asp Arg Thr Ile Gly Asn Ile Gly Leu Gly Val Arg Tyr
 Asn
 145 150 155
 160
 50

Phe Asp Lys Tyr Leu Leu Gly Gly Asn Ile Phe Tyr Asp Tyr Asp
 Phe
 165 170 175

5 Thr Arg Gly His Arg Arg Leu Gly Leu Gly Ala Glu Ala Trp Thr
 Asp
 180 185 190

10 Tyr Leu Lys Phe Ser Gly Asn Tyr Tyr His Pro Leu Ser Asp Trp
 Lys
 195 200 205

15 Asp Ser Glu Asp Phe Asp Phe Tyr Glu Glu Arg Pro Ala Arg Gly
 Trp
 210 215 220

20 Asp Ile Arg Ala Glu Val Trp Leu Pro Ser Tyr Pro Gln Leu Gly
 Gly
 225 230 235
 240

25 Lys Ile Val Phe Glu Gln Tyr Tyr Gly Asp Glu Val Ala Leu Phe
 Gly
 245 250 255

30 Thr Asp Asn Leu Glu Lys Asp Pro Tyr Ala Val Thr Leu Gly Leu
 Asn
 260 265 270

35 Tyr Gln Pro Val Pro Leu Leu Thr Val Gly Thr Asp Tyr Lys Ala
 Gly
 275 280 285

40 Thr Gly Asp Asn Ser Asp Val Ser Ile Asn Ala Thr Leu Asn Tyr
 Gln
 290 295 300

45 Phe Gly Val Pro Leu Lys Asp Gln Leu Asp Ser Asp Lys Val Lys
 Ala
 305 310 315

50 320

| | | |
|----|-------------------------------------------------------------|---------|
| | Ala His Ser Leu Met Gly Ser Arg Leu Asp Phe Val Glu Arg Asn | |
| | Asn | |
| 5 | 325 | 330 335 |
| | Phe Ile Val Leu Glu Tyr Lys Glu Lys Asp Pro Leu Asp Val Thr | |
| | Leu | |
| 10 | 340 | 345 350 |
| | Trp Leu Lys Ala Asp Ala Thr Asn Glu His Pro Glu Cys Val Ile | |
| | Lys | |
| 15 | 355 | 360 365 |
| | Asp Thr Pro Glu Ala Ala Val Gly Leu Glu Lys Cys Lys Trp Thr | |
| | Ile | |
| 20 | 370 | 375 380 |
| | Asn Ala Leu Ile Asn His His Tyr Lys Ile Val Ala Ala Ser Trp | |
| | Gln | |
| 25 | 385 | 390 395 |
| | 400 | |
| | Ala Lys Asn Asn Ala Ala Arg Thr Leu Val Met Pro Val Ile Lys | |
| | Glu | |
| 30 | 405 | 410 415 |
| | Asn Thr Leu Thr Glu Gly Asn Asn Asn His Trp Asn Leu Val Leu | |
| | Pro | |
| 35 | 420 | 425 430 |
| | Ala Trp Gln Tyr Ser Ser Asp Gln Ala Glu Gln Glu Lys Leu Asn | |
| | Thr | |
| 40 | 435 | 440 445 |
| | Trp Arg Val Arg Leu Ala Leu Glu Asp Glu Lys Gly Asn Arg Gln | |
| | Asn | |
| 45 | 450 | 455 460 |
| | Ser Gly Val Val Glu Ile Thr Val Gln Gln Asp Arg Lys Ile Glu | |
| | Leu | |
| 50 | 465 | 470 475 |
| | 480 | |

| | | | | |
|----|--------------------------------------------------------------------|-----|-----|-----|
| 5 | Ile Val Asn Asn Ile Ala Asn Pro Glu Glu Asn Asn His Ser His Glu | 485 | 490 | 495 |
| 10 | Ala Ser Ala Gln Ala Asp Gly Val Asp Gly Val Val Met Asp Leu Asp | 500 | 505 | 510 |
| 15 | Val Thr Asp Ser Phe Gly Asp Asn Thr Asp Arg Asn Gly Asp Ala Leu | 515 | 520 | 525 |
| 20 | Pro Glu Asp Asn Leu Thr Pro Gln Leu Tyr Asp Ala Gln Asp Lys Arg | 530 | 535 | 540 |
| 25 | Val Thr Leu Thr Asn Lys Pro Cys Ser Thr Asp Asn Pro Cys Val Phe | 545 | 550 | 555 |
| | 560 | | | |
| 30 | Ile Ala Lys Gln Asp Lys Glu Lys Gly Thr Val Thr Leu Ser Ser Thr | 565 | 570 | 575 |
| 35 | Leu Pro Gly Thr Tyr Arg Trp Lys Ala Lys Ala Ala Pro Tyr Asp Asp | 580 | 585 | 590 |
| 40 | Ser Asn Tyr Val Asp Val Thr Phe Leu Gly Ala Glu Ile Gly Gly Leu | 595 | 600 | 605 |
| 45 | Asn Ala Phe Ile Tyr Arg Val Gly Ala Ala Lys Pro Ser Asn Leu Ile | 610 | 615 | 620 |
| 50 | Gly Lys Asp Lys Glu Pro Leu Pro Ser Thr Thr Phe Ile Asp Leu Phe | | | |

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| | | | | |
|-----|-------------------------------------------------------------|-----|-----|-----|
| 625 | | 630 | | 635 |
| 640 | | | | |
| 5 | Tyr Gly Ala Thr Thr Ile Lys Thr Val Ser Ser Ser Arg Ser Lys | | | |
| | Asn | | | |
| | | 645 | 650 | 655 |
| 10 | Leu Thr Lys Arg Trp Cys Ser Thr Thr Thr Ser Gly Asn Leu Pro | | | |
| | Ala | | | |
| | | 660 | 665 | 670 |
| 15 | Arg Ala Ser Met Val Ser Gly Cys Thr Gly Glu His Ser Asn Glu | | | |
| | Asp | | | |
| | | 675 | 680 | 685 |
| 20 | Ile Val Ile Pro Ala Thr Asn Arg Glu Ala Ala Gln Thr Tyr Gly | | | |
| | Ala | | | |
| | | 690 | 695 | 700 |
| 25 | Gln Ala Gly Asp Gly Leu Gln Gly Tyr Gly Leu Arg Val Leu Tyr | | | |
| | Thr | | | |
| | | 705 | 710 | 715 |
| | | 720 | | |
| 30 | Lys Lys | | | |
| 35 | <210> 32 <211> 319 <212> PRT <213> Escherichia coli <400> | | | |
| | 32 | | | |
| | Met Lys Gln Asp Lys Arg Arg Gly Leu Thr Arg Ile Ala Leu Ala | | | |
| | Leu | | | |
| 40 | 1 | 5 | 10 | 15 |
| | Ala Leu Ala Gly Tyr Cys Val Ala Pro Val Ala Leu Ala Glu Asp | | | |
| | Ser | | | |
| 45 | | 20 | 25 | 30 |
| | Ala Trp Val Asp Ser Gly Glu Thr Asn Ile Phe Gln Gly Thr Ile | | | |
| | Pro | | | |
| 50 | | 35 | 40 | 45 |

| Trp | Leu | Tyr | Ser | Glu | Gly | Gly | Ser | Ala | Thr | Thr | Asp | Ala | Asp | Arg |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Val | 50 | | | | | 55 | | | | | 60 | | | |
| 5 | | | | | | | | | | | | | | |
| Thr | Leu | Thr | Ser | Asp | Leu | Lys | Gly | Ala | Arg | Pro | Gln | Gly | Met | Lys |
| Arg | 65 | | | | 70 | | | | | 75 | | | | 80 |
| 10 | | | | | | | | | | | | | | |
| Thr | Ser | Val | Phe | Thr | Arg | Val | Ile | Asn | Ile | Gly | Asp | Thr | Glu | Gly |
| Asp | | | | 85 | | | | | 90 | | | | | 95 |
| 15 | | | | | | | | | | | | | | |
| Val | Asp | Leu | Gly | Gly | Leu | Gly | Asp | Asn | Ala | Lys | Thr | Ile | Asp | Thr |
| Ile | | | 100 | | | | | 105 | | | | | 110 | |
| 20 | | | | | | | | | | | | | | |
| Arg | Trp | Met | Ser | Tyr | Lys | Asp | Ala | Gln | Gly | Gly | Asp | Pro | Lys | Glu |
| Leu | | 115 | | | | | 120 | | | | | 125 | | |
| 25 | | | | | | | | | | | | | | |
| Ala | Thr | Lys | Val | Thr | Ser | Tyr | Thr | Leu | Thr | Asp | Ala | Asp | Arg | Gly |
| Arg | 130 | | | | | | 135 | | | | 140 | | | |
| 30 | | | | | | | | | | | | | | |
| Tyr | Ile | Gly | Ile | Glu | Ile | Thr | Pro | Thr | Thr | Gln | Thr | Gly | Thr | Pro |
| Asn | 145 | | | | 150 | | | | | 155 | | | | |
| 35 | 160 | | | | | | | | | | | | | |
| Val | Gly | Thr | Ala | Leu | His | Leu | Tyr | Asp | Val | Ser | Thr | Ala | Ser | Gly |
| Gly | | | | 165 | | | | | 170 | | | | | 175 |
| 40 | | | | | | | | | | | | | | |
| Gly | Ser | Asp | Ser | Asp | Asn | Val | Ala | Pro | Gly | Pro | Val | Val | Asn | Gln |
| Asn | | | 180 | | | | | 185 | | | | | 190 | |
| 45 | | | | | | | | | | | | | | |
| Leu | Lys | Val | Ala | Ile | Phe | Val | Asp | Gly | Thr | Ser | Ile | Asn | Leu | Ile |
| Asn | | | | | | | | | | | | | | |
| 50 | | 195 | | | | | 200 | | | | | 205 | | |

Gly Ser Thr Pro Ile Glu Leu Gly Lys Thr Tyr Val Ala Lys Leu
 Tyr
 210 215 220
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Ser Asp Glu Asn Lys Asn Gly Lys Phe Asp Ala Gly Thr Asp Ala
 Asp
 225 230 235
 10 240

Val Thr Ala Asn Tyr Asp Phe Arg Trp Val Leu Ser Gly Ser Ser
 Gln
 245 250 255
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Gln Leu Gly Thr Ser Gly Gly Ile Val Asn Ser Ser Phe Asp Asn
 Asn
 260 265 270
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Asn Leu Val Ile Pro Ala Thr Asn Asp Glu Ala Arg Thr Asn Leu
 Asn
 275 280 285
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Gly Pro Ala Arg Asp Gly Lys Glu Ala Leu Ser Ile Pro Thr Asn
 Gly
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Asp Gly Val Gln Gly Tyr Lys Leu His Ile Ile Tyr Lys His Lys
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Met Lys Lys Val Leu Thr Leu Ser Leu Leu Ala Leu Cys Val Ser
 His
 1 5 10 15
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Ser Ala Val Ala Ala Asn Tyr Thr Phe Asn Asn Asp Asn Ile Ala
 Leu
 20 25 30
 45

Ser Phe Asp Asp Thr Asn Ser Thr Ile Val Leu Lys Asp Arg Arg
 Thr
 50

| | | | |
|----|--------------------------------------------------------------------|-----|----------|
| | 35 | 40 | 45 |
| 5 | Asn His Pro Ile Thr Pro Gln Glu Leu Phe Phe Leu Thr Leu Pro Asp | 50 | 55 60 |
| 10 | Glu Thr Lys Ile His Thr Ala Asp Phe Lys Ile Lys His Ile Lys Lys | 65 | 70 75 80 |
| 15 | Gln Asp Asn Ala Ile Val Ile Asp Phe Thr Arg Pro Asp Phe Asn Val | 85 | 90 95 |
| 20 | Thr Val Gln Leu Asn Leu Val Lys Gly Lys Tyr Ala Ser Ile Asp Tyr | 100 | 105 110 |
| 25 | Thr Ile Ala Ala Val Gly Gln Pro Arg Asp Val Ala Lys Ile Thr Phe | 115 | 120 125 |
| 30 | Phe Pro Thr Lys Lys Gln Phe Gln Ala Pro Tyr Val Asp Gly Ala Ile | 130 | 135 140 |
| 35 | Thr Ser Ser Pro Ile Ile Ala Asp Ser Phe Phe Ile Leu Pro Asn Lys | 145 | 150 155 |
| 40 | Pro Ile Val Asn Thr Tyr Ala Tyr Glu Ala Thr Thr Asn Leu Asn Val | 165 | 170 175 |
| 45 | Glu Leu Lys Thr Pro Ile Gln Pro Glu Thr Pro Val Ser Phe Thr Thr | 180 | 185 190 |
| 50 | Trp Phe Gly Thr Phe Pro Glu Thr Ser Gln Leu Arg Arg Ser Val Asn | | |

| | 195 | 200 | 205 |
|----|----------------------------------------------------------------------------------|-----|-----|
| 5 | Gln Phe Ile Asn Ala Val Arg Pro Arg Pro Tyr Lys Pro Tyr Leu His 210 | 215 | 220 |
| 10 | Tyr Asn Ser Trp Met Asp Ile Gly Phe Phe Thr Pro Tyr Thr Glu Gln 225 240 | 230 | 235 |
| 15 | Asp Val Leu Gly Arg Met Asp Glu Trp Asn Lys Glu Phe Ile Ser Gly 245 | 250 | 255 |
| 20 | Arg Gly Val Ala Leu Asp Ala Phe Leu Leu Asp Asp Gly Trp Asp Asp 260 | 265 | 270 |
| 25 | Leu Thr Gly Arg Trp Leu Phe Gly Pro Ala Phe Ser Asn Gly Phe Ser 275 | 280 | 285 |
| 30 | Lys Val Arg Glu Lys Ala Asp Ser Leu His Ser Ser Val Gly Leu Trp 290 | 295 | 300 |
| 35 | Leu Ser Pro Trp Gly Gly Tyr Asn Lys Pro Gln Arg Arg Ser Arg Phe 305 320 | 310 | 315 |
| 40 | Ala Cys Lys Arg Val Trp Val Arg Asn Arg Gly Arg Gln Ala Gly Ala 325 | 330 | 335 |
| 45 | Phe Gly Ser Glu Leu Leu Lys Asn Phe Asn Glu Gln Ile Ile Asn Leu 340 | 345 | 350 |
| 50 | | | |

| | | | | | | | | | | | | | | | | |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| | Ile | Lys | Asn | Glu | His | Ile | Thr | Ser | Phe | Lys | Leu | Asp | Gly | Met | Gly | |
| | Asn | | | | | | | | | | | | | | | |
| | | | 355 | | | | | 360 | | | | | 365 | | | |
| 5 | | | | | | | | | | | | | | | | |
| | Ala | Ser | Ser | His | Ile | Lys | Gly | Ser | Pro | Phe | Ala | Ser | Asp | Phe | Asp | |
| | Ala | | | | | | | | | | | | | | | |
| | | 370 | | | | | 375 | | | | | 380 | | | | |
| 10 | | | | | | | | | | | | | | | | |
| | Ser | Ile | Ala | Leu | Leu | His | Asn | Met | Arg | Arg | Ala | Asn | Pro | Asn | Leu | |
| | Phe | | | | | | | | | | | | | | | |
| | 385 | | | | | 390 | | | | | | 395 | | | | |
| | 400 | | | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | | | | |
| | Ile | Asn | Leu | Thr | Thr | Gly | Thr | Asn | Ala | Ser | Pro | Ser | Trp | Leu | Phe | |
| | Tyr | | | | | | | | | | | | | | | |
| | | | | | 405 | | | | | 410 | | | | 415 | | |
| 20 | | | | | | | | | | | | | | | | |
| | Ala | Asp | Ser | Ile | Trp | Arg | Gln | Gly | Asp | Asp | Ile | Asn | Leu | Tyr | Gly | |
| | Pro | | | | | | | | | | | | | | | |
| | | | 420 | | | | | 425 | | | | | 430 | | | |
| 25 | | | | | | | | | | | | | | | | |
| | Gly | Thr | Pro | Val | Gln | Gln | Trp | Ile | Thr | Tyr | Arg | Asp | Ala | Glu | Thr | |
| | Tyr | | | | | | | | | | | | | | | |
| | | 435 | | | | | 440 | | | | | 445 | | | | |
| 30 | | | | | | | | | | | | | | | | |
| | Arg | Ser | Ile | Val | Arg | Lys | Gly | Pro | Leu | Phe | Pro | Leu | Asn | Ser | Leu | |
| | Met | | | | | | | | | | | | | | | |
| | | 450 | | | | 455 | | | | | 460 | | | | | |
| 35 | | | | | | | | | | | | | | | | |
| | Tyr | His | Gly | Ile | Val | Ser | Ala | Glu | Asn | Ala | Tyr | Tyr | Gly | Leu | Glu | |
| | Lys | | | | | | | | | | | | | | | |
| | 465 | | | | | 470 | | | | 475 | | | | | | |
| 40 | 480 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | Val | Gln | Thr | Asp | Ser | Asp | Phe | Ala | Asp | Gln | Val | Trp | Ser | Tyr | Phe | |
| | Ala | | | | | | | | | | | | | | | |
| 45 | | | | | 485 | | | | 490 | | | | | 495 | | |
| | | | | | | | | | | | | | | | | |
| | Thr | Gly | Thr | Gln | Leu | Gln | Glu | Leu | Tyr | Ile | Thr | Pro | Ser | Met | Leu | |
| | Asn | | | | | | | | | | | | | | | |
| 50 | | | | 500 | | | | 505 | | | | | 510 | | | |

Lys Val Lys Trp Asp Thr Leu Ala Lys Ala Ala Lys Trp Ser Lys
 Glu
 515 520 525
 5

Asn Ala Ser Val Leu Val Asp Thr His Trp Ile Gly Gly Asp Pro
 Thr
 530 535 540
 10

Ala Leu Ala Val Tyr Gly Trp Ala Ser Trp Ser Lys Asp Lys Ala
 Ile
 545 550 555
 15 560

Leu Gly Leu Arg Asn Pro Ser Asp Lys Pro Gln Thr Tyr Tyr Leu
 Asp
 565 570 575
 20

Leu Ala Lys Asp Phe Glu Ile Pro Ala Gly Asn Ala Ala Gln Phe
 Ser
 580 585 590
 25

Leu Lys Ala Val Tyr Gly Ser Asn Lys Thr Val Pro Val Glu Tyr
 Lys
 595 600 605
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Asn Ala Thr Val Ile Thr Leu Gln Pro Leu Glu Thr Leu Val Phe
 Glu
 610 615 620
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Ala Val Thr Ile Asn
 625
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 Tyr
 1 5 10 15
 45

Thr Val Ala Ser Glu Thr Ala Lys Ser Arg Gly Lys Lys Ser Gly
 Arg
 50

| | 20 | 25 | 30 |
|----|--------------------------------------------------------------------|-----|----------|
| 5 | Ser Lys Leu Leu Ile Ser Ala Leu Val Ala Gly Gly Leu Leu Ser Ser | 35 | 40 45 |
| 10 | Phe Gly Ala Ser Ala Asp Asn Tyr Thr Gly Gln Pro Thr Asp Tyr Gly | 50 | 55 60 |
| 15 | Asp Gly Ser Ala Gly Asp Gly Trp Val Ala Ile Gly Lys Gly Ala Lys | 65 | 70 75 80 |
| 20 | Ala Asn Thr Phe Met Asn Thr Ser Gly Ala Ser Thr Ala Leu Gly Tyr | 85 | 90 95 |
| 25 | Asp Ala Ile Ala Glu Gly Glu Tyr Ser Ser Ala Ile Gly Ser Lys Thr | 100 | 105 110 |
| 30 | Leu Ala Thr Gly Gly Ala Ser Met Ala Phe Gly Val Ser Ala Lys Ala | 115 | 120 125 |
| 35 | Met Gly Asp Arg Ser Val Ala Leu Gly Ala Ser Ser Val Ala Asn Gly | 130 | 135 140 |
| 40 | Asp Arg Ser Met Ala Phe Gly Arg Tyr Ala Lys Thr Asn Gly Phe Thr | 145 | 150 155 |
| | | 160 | |
| 45 | Ser Leu Ala Ile Gly Asp Ser Ser Leu Ala Asp Gly Glu Lys Thr Ile | 165 | 170 175 |
| 50 | Ala Leu Gly Asn Thr Ala Lys Ala Tyr Glu Ile Met Ser Ile Ala Leu | | |

| | 180 | 185 | 190 |
|----|--------------------------------------------------------------------|-----|-----|
| 5 | Gly Asp Asn Ala Asn Ala Ser Lys Glu Tyr Ala Met Ala Leu Gly Ala | | |
| | 195 | 200 | 205 |
| 10 | Ser Ser Lys Ala Gly Gly Ala Asp Ser Leu Ala Phe Gly Arg Lys Ser | | |
| | 210 | 215 | 220 |
| 15 | Thr Ala Asn Ser Thr Gly Ser Leu Ala Ile Gly Ala Asp Ser Ser Ser | | |
| | 225 | 230 | 235 |
| | 240 | | |
| 20 | Ser Asn Asp Asn Ala Ile Ala Ile Gly Asn Lys Thr Gln Ala Leu Gly | | |
| | 245 | 250 | 255 |
| 25 | Val Asn Ser Met Ala Leu Gly Asn Ala Ser Gln Ala Ser Gly Glu Ser | | |
| | 260 | 265 | 270 |
| 30 | Ser Ile Ala Leu Gly Asn Thr Ser Glu Ala Ser Glu Gln Asn Ala Ile | | |
| | 275 | 280 | 285 |
| 35 | Ala Leu Gly Gln Gly Ser Ile Ala Ser Lys Val Asn Ser Ile Ala Leu | | |
| | 290 | 295 | 300 |
| 40 | Gly Ser Asn Ser Leu Ser Ser Gly Glu Asn Ala Ile Ala Leu Gly Glu | | |
| | 305 | 310 | 315 |
| | 320 | | |
| 45 | Gly Ser Ala Ala Gly Gly Ser Asn Ser Leu Ala Phe Gly Ser Gln Ser | | |
| | 325 | 330 | 335 |
| 50 | | | |

| | | | | | | | | | | | | | | | | |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| | Arg | Ala | Asn | Gly | Asn | Asp | Ser | Val | Ala | Ile | Gly | Val | Gly | Ala | Ala | |
| | Ala | | | | | | | | | | | | | | | |
| | | | | 340 | | | | | 345 | | | | | 350 | | |
| 5 | Ala | Thr | Asp | Asn | Ser | Val | Ala | Ile | Gly | Ala | Gly | Ser | Thr | Thr | Asp | |
| | Ala | | | | | | | | | | | | | | | |
| | | | 355 | | | | | 360 | | | | | 365 | | | |
| 10 | Ser | Asn | Thr | Val | Ser | Val | Gly | Asn | Ser | Ala | Thr | Lys | Arg | Lys | Ile | |
| | Val | | | | | | | | | | | | | | | |
| | | 370 | | | | | 375 | | | | | 380 | | | | |
| 15 | Asn | Met | Ala | Ala | Gly | Ala | Ile | Ser | Asn | Thr | Ser | Thr | Asp | Ala | Ile | |
| | Asn | | | | | | | | | | | | | | | |
| | 385 | | | | | 390 | | | | | 395 | | | | | |
| | 400 | | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | | | |
| | Gly | Ser | Gln | Leu | Tyr | Thr | Ile | Ser | Asp | Ser | Val | Ala | Lys | Arg | Leu | |
| | Gly | | | | | | | | | | | | | | | |
| | | | | 405 | | | | | 410 | | | | | 415 | | |
| 25 | | | | | | | | | | | | | | | | |
| | Gly | Gly | Ala | Thr | Val | Gly | Ser | Asp | Gly | Thr | Val | Thr | Ala | Val | Ser | |
| | Tyr | | | | | | | | | | | | | | | |
| | | | 420 | | | | | 425 | | | | | 430 | | | |
| 30 | | | | | | | | | | | | | | | | |
| | Ala | Leu | Arg | Ser | Gly | Thr | Tyr | Asn | Asn | Val | Gly | Asp | Ala | Leu | Ser | |
| | Gly | | | | | | | | | | | | | | | |
| | | 435 | | | | | 440 | | | | | 445 | | | | |
| 35 | | | | | | | | | | | | | | | | |
| | Ile | Asp | Asn | Asn | Thr | Leu | Gln | Trp | Asn | Lys | Thr | Ala | Gly | Ala | Phe | |
| | Ser | | | | | | | | | | | | | | | |
| | | 450 | | | | 455 | | | | | 460 | | | | | |
| 40 | | | | | | | | | | | | | | | | |
| | Ala | Asn | His | Gly | Ala | Asn | Ala | Thr | Asn | Lys | Ile | Thr | Asn | Val | Ala | |
| | Lys | | | | | | | | | | | | | | | |
| | 465 | | | | 470 | | | | 475 | | | | | | | |
| 45 | 480 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | Gly | Thr | Val | Ser | Ala | Thr | Ser | Thr | Asp | Val | Val | Asn | Gly | Ser | Gln | |
| | Leu | | | | | | | | | | | | | | | |
| 50 | | | | | 485 | | | | 490 | | | | | 495 | | |

| | | | | |
|----|--------------------------------------------------------------------|-----|-----|-----|
| | Tyr Asp Leu Gln Gln Asp Ala Leu Leu Trp Asn Gly Thr Ala Phe Ser | | | |
| 5 | | 500 | 505 | 510 |
| | Ala Ala His Gly Thr Glu Ala Thr Ser Lys Ile Thr Asn Val Thr Ala | | | |
| 10 | | 515 | 520 | 525 |
| | Gly Asn Leu Thr Ala Gly Ser Thr Asp Ala Val Asn Gly Ser Gln Leu | | | |
| 15 | | 530 | 535 | 540 |
| | Lys Thr Thr Asn Asp Asn Val Thr Thr Asn Thr Thr Asn Ile Ala Thr | | | |
| 20 | | 545 | 550 | 555 |
| | | 560 | | |
| | Asn Thr Thr Asn Ile Thr Asn Leu Thr Asp Ala Val Asn Gly Leu Gly | | | |
| 25 | | 565 | 570 | 575 |
| | Asp Asp Ser Leu Leu Trp Asn Lys Ala Ala Gly Ala Phe Ser Ala Ala | | | |
| 30 | | 580 | 585 | 590 |
| | His Gly Thr Glu Ala Thr Ser Lys Ile Thr Asn Val Thr Ala Gly Asn | | | |
| 35 | | 595 | 600 | 605 |
| | Leu Thr Ala Gly Ser Thr Asp Ala Val Asn Gly Ser Gln Leu Lys Thr | | | |
| 40 | | 610 | 615 | 620 |
| | Thr Asn Asp Asn Val Thr Thr Asn Thr Thr Asn Ile Ala Thr Asn Thr | | | |
| 45 | | 625 | 630 | 635 |
| | | 640 | | |
| | Thr Asn Ile Thr Asn Leu Thr Asp Ala Val Asn Gly Leu Gly Asp Asp | | | |
| 50 | | 645 | 650 | 655 |

| | | | | | | |
|----|--------------------------------------------------------------------|-----|--|-----|--|-----|
| | | 805 | | 810 | | 815 |
| 5 | Ser Ala Ala His Gly Thr Asp Ala Thr Ser Lys Ile Thr Asn Val Lys | 820 | | 825 | | 830 |
| 10 | Ala Gly Asp Leu Thr Ala Gly Ser Thr Asp Ala Val Asn Gly Ser Gln | 835 | | 840 | | 845 |
| 15 | Leu Lys Thr Thr Asn Asp Asn Val Ser Thr Asn Thr Thr Asn Ile Thr | 850 | | 855 | | 860 |
| 20 | Asn Leu Thr Asp Ser Val Gly Asp Leu Lys Asp Asp Ser Leu Leu Trp | 865 | | 870 | | 875 |
| | 880 | | | | | |
| 25 | Asn Lys Ala Ala Gly Ala Phe Ser Ala Ala His Gly Thr Glu Ala Thr | 885 | | 890 | | 895 |
| 30 | Ser Lys Ile Thr Asn Leu Leu Ala Gly Lys Ile Ser Ser Asn Ser Thr | 900 | | 905 | | 910 |
| 35 | Asp Ala Ile Asn Gly Ser Gln Leu Tyr Gly Val Ala Asp Ser Phe Thr | 915 | | 920 | | 925 |
| 40 | Ser Tyr Leu Gly Gly Gly Ala Asp Ile Ser Asp Thr Gly Val Leu Ser | 930 | | 935 | | 940 |
| 45 | Gly Pro Thr Tyr Thr Ile Gly Gly Thr Asp Tyr Thr Asn Val Gly Asp | 945 | | 950 | | 955 |
| | 960 | | | | | |

Ala Leu Ala Ala Ile Asn Thr Ser Phe Ser Thr Ser Leu Gly Asp
Ala
965 970 975

5
Leu Leu Trp Asp Ala Thr Ala Gly Lys Phe Ser Ala Lys His Gly
Ile
980 985 990

10
Asn Asn Ala Pro Ser Val Ile Thr Asp Val Ala Asn Gly Ala Val
Ser
995 1000 1005

15
Ser Thr Ser Ser Asp Ala Ile Asn Gly Ser Gln Leu Tyr Gly Val
1010 1015 1020

20
Ser Asp Tyr Ile Ala Asp Ala Leu Gly Gly Asn Ala Val Val Asn
1025 1030 1035

25
Thr Asp Gly Ser Ile Thr Thr Pro Thr Tyr Ala Ile Ala Gly Gly
1040 1045 1050

30
Ser Tyr Asn Asn Val Gly Asp Ala Leu Glu Ala Ile Asp Thr Thr
1055 1060 1065

35
Leu Asp Asp Ala Leu Leu Trp Asp Thr Thr Ala Asn Gly Gly Asn
1070 1075 1080

40
Gly Ala Phe Ser Ala Ala His Gly Lys Asp Lys Thr Ala Ser Val
1085 1090 1095

45
Ile Thr Asn Val Ala Asn Gly Ala Val Ser Ala Thr Ser Asn Asp
1100 1105 1110

50
Ala Ile Asn Gly Ser Gln Leu Tyr Ser Thr Asn Lys Tyr Ile Ala
1115 1120 1125

Asp Ala Leu Gly Gly Asp Ala Glu Val Asn Ala Asp Gly Thr Ile
1130 1135 1140

| | | | | | | | | | | | | | | | |
|----|------|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|------|-----|-----|-----|
| | Thr | Ala | Pro | Thr | Tyr | Thr | Ile | Ala | Asn | Thr | Asp | Tyr | Asn | Asn | Val |
| | 1145 | | | | | | 1150 | | | | | 1155 | | | |
| 5 | Gly | Glu | Ala | Leu | Asp | Ala | Leu | Asp | Asn | Asn | Ala | Leu | Leu | Trp | Asp |
| | 1160 | | | | | | 1165 | | | | | 1170 | | | |
| 10 | Glu | Asp | Ala | Gly | Ala | Tyr | Asn | Ala | Ser | His | Asp | Gly | Asn | Ala | Ser |
| | 1175 | | | | | | 1180 | | | | | 1185 | | | |
| 15 | Lys | Ile | Thr | Asn | Val | Ala | Ala | Gly | Asp | Leu | Ser | Thr | Thr | Ser | Thr |
| | 1190 | | | | | | 1195 | | | | | 1200 | | | |
| 20 | Asp | Ala | Val | Asn | Gly | Ser | Gln | Leu | Asn | Ala | Thr | Asn | Ile | Leu | Val |
| | 1205 | | | | | | 1210 | | | | | 1215 | | | |
| 25 | Thr | Gln | Asn | Ser | Gln | Met | Ile | Asn | Gln | Leu | Ala | Gly | Asn | Thr | Ser |
| | 1220 | | | | | | 1225 | | | | | 1230 | | | |
| 30 | Glu | Thr | Tyr | Ile | Glu | Glu | Asn | Gly | Ala | Gly | Ile | Asn | Tyr | Val | Arg |
| | 1235 | | | | | | 1240 | | | | | 1245 | | | |
| 35 | Thr | Asn | Asp | Ser | Gly | Leu | Ala | Phe | Asn | Asp | Ala | Ser | Ala | Ser | Gly |
| | 1250 | | | | | | 1255 | | | | | 1260 | | | |
| 40 | Ile | Gly | Ala | Thr | Ala | Val | Gly | Tyr | Asn | Ala | Val | Ala | Ser | His | Ala |
| | 1265 | | | | | | 1270 | | | | | 1275 | | | |
| 45 | Ser | Ser | Val | Ala | Ile | Gly | Gln | Asp | Ser | Ile | Ser | Glu | Val | Asp | Thr |
| | 1280 | | | | | | 1285 | | | | | 1290 | | | |
| 50 | Gly | Ile | Ala | Leu | Gly | Ser | Ser | Ser | Val | Ser | Ser | Arg | Val | Ile | Val |
| | 1295 | | | | | | 1300 | | | | | 1305 | | | |
| 55 | Lys | Gly | Thr | Arg | Asn | Thr | Ser | Val | Ser | Glu | Glu | Gly | Val | Val | Ile |
| | 1310 | | | | | | 1315 | | | | | 1320 | | | |
| 60 | Gly | Tyr | Asp | Thr | Thr | Asp | Gly | Glu | Leu | Leu | Gly | Ala | Leu | Ser | Ile |
| | 1325 | | | | | | 1330 | | | | | 1335 | | | |

| | | | | | | | | | | | | | | | |
|----|------|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|------|-----|-----|-----|
| | Gly | Asp | Asp | Gly | Lys | Tyr | Arg | Gln | Ile | Ile | Asn | Val | Ala | Asp | Gly |
| | 1340 | | | | | | 1345 | | | | | 1350 | | | |
| 5 | Ser | Glu | Ala | His | Asp | Ala | Val | Thr | Val | Arg | Gln | Leu | Gln | Asn | Ala |
| | 1355 | | | | | | 1360 | | | | | 1365 | | | |
| 10 | Ile | Gly | Ala | Val | Ala | Thr | Thr | Pro | Thr | Lys | Tyr | Tyr | His | Ala | Asn |
| | 1370 | | | | | | 1375 | | | | | 1380 | | | |
| 15 | Ser | Thr | Ala | Glu | Asp | Ser | Leu | Ala | Val | Gly | Glu | Asp | Ser | Leu | Ala |
| | 1385 | | | | | | 1390 | | | | | 1395 | | | |
| 20 | Met | Gly | Ala | Lys | Thr | Ile | Val | Asn | Gly | Asn | Ala | Gly | Ile | Gly | Ile |
| | 1400 | | | | | | 1405 | | | | | 1410 | | | |
| | Gly | Leu | Asn | Thr | Leu | Val | Leu | Ala | Asp | Ala | Ile | Asn | Gly | Ile | Ala |
| | 1415 | | | | | | 1420 | | | | | 1425 | | | |
| 25 | Ile | Gly | Ser | Asn | Ala | Arg | Ala | Asn | His | Ala | Asp | Ser | Ile | Ala | Met |
| | 1430 | | | | | | 1435 | | | | | 1440 | | | |
| 30 | Gly | Asn | Gly | Ser | Gln | Thr | Thr | Arg | Gly | Ala | Gln | Thr | Asn | Tyr | Thr |
| | 1445 | | | | | | 1450 | | | | | 1455 | | | |
| 35 | Ala | Tyr | Asn | Met | Asp | Ala | Pro | Gln | Asn | Ser | Val | Gly | Glu | Phe | Ser |
| | 1460 | | | | | | 1465 | | | | | 1470 | | | |
| 40 | Val | Gly | Ser | Glu | Asp | Gly | Gln | Arg | Gln | Ile | Thr | Asn | Val | Ala | Ala |
| | 1475 | | | | | | 1480 | | | | | 1485 | | | |
| | Gly | Ser | Ala | Asp | Thr | Asp | Ala | Val | Asn | Val | Gly | Gln | Leu | Lys | Val |
| | 1490 | | | | | | 1495 | | | | | 1500 | | | |
| 45 | Thr | Asp | Ala | Gln | Val | Ser | Gln | Asn | Thr | Gln | Ser | Ile | Thr | Asn | Leu |
| | 1505 | | | | | | 1510 | | | | | 1515 | | | |
| 50 | Asn | Thr | Gln | Val | Thr | Asn | Leu | Asp | Thr | Arg | Val | Thr | Asn | Ile | Glu |
| | 1520 | | | | | | 1525 | | | | | 1530 | | | |

5 Asn Gly Ile Gly Asp Ile Val Thr Thr Gly Ser Thr Lys Tyr Phe
 1535 1540 1545
 Lys Thr Asn Thr Asp Gly Ala Asp Ala Asn Ala Gln Gly Lys Asp
 1550 1555 1560
 10 Ser Val Ala Ile Gly Ser Gly Ser Ile Ala Ala Ala Asp Asn Ser
 1565 1570 1575
 15 Val Ala Leu Gly Thr Gly Ser Val Ala Asp Glu Glu Asn Thr Ile
 1580 1585 1590
 20 Ser Val Gly Ser Ser Thr Asn Gln Arg Arg Ile Thr Asn Val Ala
 1595 1600 1605
 25 Ala Gly Val Asn Ala Thr Asp Ala Val Asn Val Ser Gln Leu Lys
 1610 1615 1620
 Ser Ser Glu Ala Gly Gly Val Arg Tyr Asp Thr Lys Ala Asp Gly
 1625 1630 1635
 30 Ser Ile Asp Tyr Ser Asn Ile Thr Leu Gly Gly Gly Asn Ser Gly
 1640 1645 1650
 35 Thr Thr Arg Ile Ser Asn Val Ser Ala Gly Val Asn Asn Asn Asp
 1655 1660 1665
 40 Ala Val Asn Tyr Ala Gln Leu Lys Gln Ser Val Gln Glu Thr Lys
 1670 1675 1680
 45 Gln Tyr Thr Asp Gln Arg Met Val Glu Met Asp Asn Lys Leu Ser
 1685 1690 1695
 Lys Thr Glu Ser Lys Leu Ser Gly Gly Ile Ala Ser Ala Met Ala
 1700 1705 1710
 50 Met Thr Gly Leu Pro Gln Ala Tyr Thr Pro Gly Ala Ser Met Ala

| | | | | | |
|----|-----------------------------------------------------------------------------------|--|------|--|------|
| | 1715 | | 1720 | | 1725 |
| 5 | Ser Ile Gly Gly Gly Thr Tyr Asn Gly Glu Ser Ala Val Ala Leu 1730 1735 1740 | | | | |
| 10 | Gly Val Ser Met Val Ser Ala Asn Gly Arg Trp Val Tyr Lys Leu 1745 1750 1755 | | | | |
| 15 | Gln Gly Ser Thr Asn Ser Gln Gly Glu Tyr Ser Ala Ala Leu Gly 1760 1765 1770 | | | | |
| | Ala Gly Ile Gln Trp 1775 | | | | |
| 20 | <210> 35 <211> 227 <212> PRT <213> Escherichia coli <400> 35 | | | | |
| 25 | Met Asn Leu Lys Lys Thr Leu Leu Ser Val Leu Met Ile Leu Gln Leu 1 5 10 15 | | | | |
| 30 | Cys Leu Leu Val Gly Cys Asp Tyr Ile Glu Lys Ala Ser Lys Val Asp 20 25 30 | | | | |
| 35 | Asp Leu Val Thr Gln Gln Glu Leu Gln Lys Ser Lys Ile Glu Ala Leu 35 40 45 | | | | |
| 40 | Glu Lys Gln Gln Glu Leu Asp Lys Arg Lys Ile Glu His Phe Glu Lys 50 55 60 | | | | |
| 45 | Gln Gln Thr Thr Ile Ile Asn Ser Thr Lys Thr Leu Ala Gly Val Val 65 70 75 80 | | | | |
| 50 | Lys Ala Val Lys Asn Lys Gln Asp Glu Phe Val Phe Thr Glu Phe Asn 85 90 95 | | | | |

Pro Ala Gln Thr Gln Tyr Phe Ile Leu Asn Asn Gly Ser Val Gly
 Leu
 100 105 110
 5

Ala Gly Lys Ile Leu Ser Ile Asp Ala Val Glu Asn Gly Ser Val
 Ile
 115 120 125
 10

Arg Ile Ser Leu Val Asn Leu Leu Ser Val Pro Val Ser Asn Met
 Gly
 130 135 140
 15

Phe Tyr Ala Thr Trp Gly Gly Glu Lys Pro Thr Asp Ile Asn Ala
 Leu
 145 150 155
 20

Ala Lys Trp Gln Gln Leu Leu Phe Ser Thr Ala Met Ash Ser Ser
 Leu
 165 170 175
 25

Lys Leu Leu Pro Gly Gln Trp Gln Asp Ile Asn Leu Thr Leu Lys
 Gly
 180 185 190
 30

Val Ser Pro Asn Asn Leu Lys Tyr Leu Lys Leu Ala Ile Asn Met
 Ala
 195 200 205
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Asn Ile Gln Phe Asp Arg Leu Gln Pro Ala Glu Ser Pro Gln Arg
 Lys
 210 215 220
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Asn Lys Lys
 225
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<210> 36 <211> 1109 <212> PRT <213> Escherichia coli
 <400> 36

Met Lys Arg Val Val Arg Leu Leu Gly Val Gly Leu Leu Leu Leu
 Val
 50

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| | | | | | | |
|----|-----------------------------------------------------------------|-----|--|-----|--|-----|
| 1 | | 5 | | 10 | | 15 |
| 5 | Val Leu Leu Leu Ile Leu Phe Val Leu Ala Gln Thr Thr Pro Leu Ile | 20 | | 25 | | 30 |
| 10 | Ser Ala Gln Asp Glu His Ala Val Trp Leu Arg Leu Leu Ile Thr Ala | 35 | | 40 | | 45 |
| 15 | Ile Val Ile Cys Leu Leu Ser Met Cys Ile Phe Phe Leu Phe Ser Phe | 50 | | 55 | | 60 |
| 20 | Arg Gln Asn Glu Ala Ser Thr Ile Ser Leu Tyr Ala Gln Pro Thr Asp | 65 | | 70 | | 75 |
| | | | | | | 80 |
| 25 | Ile Lys Glu Ile Asn Thr Glu Gln Pro Asn Tyr Ala Ser Leu Leu Thr | 85 | | 90 | | 95 |
| 30 | Ile Tyr Leu Arg Asp Arg Tyr Gly Pro Phe Trp Arg Arg Lys Val Arg | 100 | | 105 | | 110 |
| 35 | Leu Leu Leu Val Thr Gly Glu Pro Glu Gln Ala Glu Ala Ile Ala Pro | 115 | | 120 | | 125 |
| 40 | Gly Leu Thr Gly Gln His Trp Leu Glu Gly Asp His Thr Val Leu Ile | 130 | | 135 | | 140 |
| 45 | Tyr Gly Gly Arg Pro Thr Ala Glu Pro Asp Val Thr Leu Leu Thr Ala | 145 | | 150 | | 155 |
| | | 160 | | | | |
| 50 | Leu Lys Lys Leu Arg Arg Ser Arg Pro Leu Asp Gly Ile Ile Trp Ala | | | | | |

| | | | | | | |
|----|-----------------------------------------------------------------|-----|-----|-----|-----|-----|
| | | 165 | | 170 | | 175 |
| 5 | Leu Thr Glu Glu Gln Ser Arg Gln Thr Ala Gln Leu Asp Lys Gly Trp | 180 | | 185 | | 190 |
| 10 | Arg Gly Leu Ile Asn Gly Gly Lys Arg Leu Gly Phe Gln Ala Pro Leu | 195 | | 200 | | 205 |
| 15 | Tyr Leu Trp Gln Val Cys Asp Asp Gly Asp Tyr Gln Thr Gly Arg Pro | 210 | | 215 | | 220 |
| 20 | Leu Gln Ser Val Gly Cys Leu Leu Pro Glu Arg Cys Thr Pro Glu Gln | 225 | 230 | | 235 | |
| | | 240 | | | | |
| 25 | Leu Ala Val Met Leu Glu Ala Ala Ala Asp Gly Thr Gly His Val Ala | 245 | | 250 | | 255 |
| 30 | Ala Thr Asp Arg Tyr Arg Met Phe Ser Ala Ala Ser Gly Ser Tyr Pro | 260 | | 265 | | 270 |
| 35 | Cys Arg Ala Gly Tyr Cys Ser Leu Ala Asp Arg Pro Glu Thr Ala Ala | 275 | | 280 | | 285 |
| 40 | Gly Arg Arg Arg Ile Phe Phe Pro Ala Pro Ala Arg Pro Asp Val Gln | 290 | | 295 | | 300 |
| 45 | Pro Ala Ala Cys Arg Arg Ala Gly Gly Gln His Leu Met Gln Trp Leu | 305 | 310 | | 315 | |
| | | 320 | | | | |
| 50 | | | | | | |

Pro Ser Pro Val Trp Ala Gly Val Thr Val Ile Thr Arg Ala Gly
Ala
325 330 335

5 Arg Trp Val Phe Leu Trp Leu Arg Thr Ala Leu Met Ser Ala Val
Cys
340 345 350

10 Val Leu Val Ile Trp Gly Ala Gly Met Thr Thr Ser Phe Phe Ala
Asn
355 360 365

15 Arg Ala Leu Val Gln Glu Thr Gly Ile Gln Thr Ala Arg Ala Leu
Asp
370 375 380

20 Thr Arg Leu Pro Leu Ala Glu Gln Leu Val Ala Leu His Thr Leu
Gln
385 390 395
400

25

Gly Glu Leu Glu Arg Leu Gln Tyr Arg Ile Arg Glu Gly Ala Pro
Trp

405 410 415

30

Tyr Gln Arg Phe Gly Leu Glu Arg Asn Gln Gln Leu Leu Ala Ala
Ala

420 425 430

35

Phe Pro Gly Tyr Ala Gln Ala Ala Asn Arg Leu Val Arg Asp Val
Ala

435 440 445

40

Val Asp His Leu Gln Gln Gln Leu Asn Ala Phe Val Ala Leu Pro
Pro

450 455 460

```

45      Asn Ser Pro Gln Arg Thr Ala Thr Gly Glu Gln Arg Tyr Lys Gln
      Leu
      465              470              475
50      480

```

Lys Ala Leu Leu Met Thr Ser Arg Pro Glu Lys Ala Asp Ala Ala
 Phe
 485 490 495
 5

Phe Ser Thr Thr Leu Met Ala Asp Gly Leu Arg Tyr Glu Asn Ile
 Pro
 500 505 510
 10

Glu Gly Val Arg Gln Ser Val Leu Pro Ser Leu Leu Thr Phe Trp
 Thr
 515 520 525
 15

Ala Asn Leu Pro Glu His Pro Gln Trp Lys Thr Ser Pro Pro Pro
 Glu
 530 535 540
 20

Leu Thr Gly Ala Val Arg Lys Ile Leu Leu Arg Gln Ile Gly Val
 Arg
 545 550 555
 25 560

Asn Ala Glu Asn Thr Leu Tyr Gln Asn Val Leu Gln Gln Val Ser
 Arg
 565 570 575
 30

Asn Tyr Ala Asp Met Thr Leu Ala Asp Met Thr Gly Asp Thr Leu
 Thr
 580 585 590
 35

Glu Ser Leu Phe Ser Thr Glu Gln Thr Val Pro Gly Met Phe Thr
 Arg
 595 600 605
 40

Gln Ala Trp Glu Gly Gln Val Arg Glu Ala Ile Glu Gln Val Val
 Thr
 610 615 620
 45

Ala Arg Arg Glu Glu Ile Asp Trp Val Leu Ser Asp Arg Gln Gln
 Asp
 625 630 635
 50 640

| | | | | |
|----|-----------------------------------------------------------------|-----|-----|-----|
| 5 | Thr Ser Ala Asp Ile Ser Pro Asp Thr Leu Arg Asn Arg Leu Thr Ser | 645 | 650 | 655 |
| 10 | Arg Tyr Phe Thr Asp Phe Ala Gly Ser Trp Leu Ala Phe Leu Asn Ser | 660 | 665 | 670 |
| 15 | Ile His Trp Lys Lys Glu Asp Ser Leu Ser Gly Ile Leu Asp Gln Leu | 675 | 680 | 685 |
| 20 | Thr Leu Met Ala Asp Ala Arg Gln Ser Pro Leu Ile Ala Leu Thr Asp | 690 | 695 | 700 |
| 25 | Thr Leu Ala Trp Gln Ala Ala Thr Gly Arg Glu Asn Arg Gly Leu Ser | 705 | 710 | 715 |
| | | 720 | | |
| 30 | Asp Ser Leu Ala Lys Ser Ala Gln Glu Leu Phe Asn Gly Lys Glu Lys | 725 | 730 | 735 |
| 35 | Thr Pro Gln Gln Ser Arg Glu Gly Asp Asp Val Pro Val Gly Pro Leu | 740 | 745 | 750 |
| 40 | Asp Lys Thr Phe Thr Pro Leu Leu Arg Leu Leu Gly Asp Lys Ala Gly | 755 | 760 | 765 |
| 45 | Gly Gly Asp Ser Gln Leu Ser Leu Gln Thr Tyr Leu Thr Arg Val Thr | 770 | 775 | 780 |
| 50 | Arg Val Arg Leu Lys Leu Gln Gln Val Thr Asn Ala Pro Asp Pro Gln | | | |

785
800

790

795

5 Glu Met Thr Gln Gln Leu Ala Gln Thr Val Leu Gln Gly Lys Thr
Val
805 810 815

10 Asp Leu Thr Asp Thr Arg Asp Tyr Gly Arg Leu Ile Ala Ala Ser
Leu
820 825 830

15 Gly Glu Glu Trp Ser Gly Phe Gly Gln Ala Leu Phe Val Arg Pro
Val
835 840 845

20 Glu Gln Ser Trp Arg Gln Val Leu Thr Pro Ala Ala Asp Ser Leu
Asn
850 855 860

25 Arg Gln Trp Gln Arg Ala Ile Val Ser His Trp Asn Gln Asp Phe
Ala
865 870 875
880

30 Gly Arg Tyr Pro Phe Lys Ala Ser Gln Asn Asp Ala Ser Leu Pro
Leu
885 890 895

35 Leu Ala Gln Tyr Leu Arg Asp Asp Gly Arg Ile Asn Leu Phe Ile
Ala
900 905 910

40 Ala Asn Leu Ser Gly Val Leu Lys Arg Glu Gly Arg Tyr Trp Val
Ala
915 920 925

45 Asp Ala Met Asn Thr Gln Gly Leu Thr Val Asn Pro Asp Phe Ile
Arg
930 935 940

50

Ala Leu Asn Arg Leu Arg Asp Val Ala Asp Thr Ala Phe Ala Ser
 Gly
 945 950 955
 960

5

Asp Ala Gly Ile His Phe Glu Leu Arg Ala Lys Pro Ala Arg Asp
 Val
 965 970 975

10

Met Lys Thr His Leu Val Ile Asp Gly Gln Glu Leu Glu Tyr Phe
 Asn
 980 985 990

15

Gln Lys Glu Arg Trp Gln Arg Phe Asn Trp Pro Asp Glu Gln Trp
 Gln
 995 1000 1005

20

Pro Gly Ala Ser Leu Ser Trp Thr Ser Thr Gln Ala Met Glu Arg
 1010 1015 1020

25

Ile Leu Ala Asp Tyr Arg Gly Ser Trp Ser Leu Ile Arg Leu Leu
 1025 1030 1035

30

Glu Gln Ala Gln Val Thr Pro Val Asp Ser Ser Thr Phe Lys Val
 1040 1045 1050

35

Val Trp Lys Ala Gln Asp Gly Leu Pro Leu Asn Tyr Leu Leu Arg
 1055 1060 1065

40

Val Glu Gln Gly Lys Gly Pro Leu Ala Leu Leu Glu Leu Lys Asn
 1070 1075 1080

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Phe Arg Leu Pro Gly Gln Val Phe Leu Thr Gly Lys Ser Met Lys
 1085 1090 1095

Asp Val Glu Glu Tyr Gly Glu Asp Ala Asp Glu
 1100 1105

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Ser Trp Arg Leu Val Ile Lys Arg Asp Glu Leu Glu Ala Asp Lys
Pro
145 150 155
160

Arg Ser Ile Glu Leu Met Arg Ser Asp Leu Arg Leu Leu Pro Leu
 Lys
 5 165 170 175
 Asp Lys
 10
 <210> 38 <211> 280 <212> PRT <213> Escherichia coli <400>
 38
 Met Ile Ser Gly Gly Asn Met Leu Lys Glu Trp Met Ile Phe Thr
 15 Cys
 1 5 10 15
 Ser Leu Leu Thr Leu Ala Gly Ala Ser Leu Pro Leu Ser Gly Cys
 20 Ile
 20 25 30
 Ser Arg Gly Gln Glu Ser Ile Ser Glu Gly Ala Ala Phe Gly Ala
 25 Gly
 35 40 45
 Ile Leu Arg Glu Pro Gly Ala Thr Lys Lys Ala Asp Thr Lys Asp
 30 Leu
 50 55 60
 Asn Val Pro Pro Pro Val Tyr Gly Pro Pro Gln Val Ile Phe Arg
 35 Ile
 65 70 75 80
 Asp Asp Asn Arg Tyr Phe Thr Leu Glu Asn Tyr Thr His Cys Glu
 40 Asn
 85 90 95
 Gly Gln Thr Phe Tyr Asn Asn Lys Ala Lys Asn Ile His Val Lys
 45 Ile
 100 105 110
 Leu Asp Ala Ser Gly Tyr Leu Phe Lys Gly Arg Leu Phe Trp Leu
 50 Ser
 115 120 125

| | | |
|----|-------------------------------------------------------------|-------------|
| | Thr Arg Asp Asp Phe Leu Ala Phe Pro Ala Thr Leu Asn Thr Arg | |
| | His | |
| 5 | 130 | 135 140 |
| | Ala Ser Cys Met Gly Ser Asn Lys Gly Cys Met Asn Ala Val Ile | |
| | Val | |
| 10 | 145 | 150 155 |
| | 160 | |
| | Thr Thr Asp Gly Gly Lys Arg Arg Ser Gly Val Pro Tyr Gly Ser | |
| 15 | Tyr | 165 170 175 |
| | Thr Gln Asn Pro Thr Gly Ala Thr Arg Asp Tyr Asp Met Leu Val | |
| 20 | Met | 180 185 190 |
| | Asn Asp Gly Phe Tyr Leu Leu Arg Tyr Arg Gly Gly Gln Gly Arg | |
| 25 | Phe | 195 200 205 |
| | Ser Pro Val Ile Leu Arg Trp Ile Leu Ser Thr Glu Asp Ser Ser | |
| 30 | Gly | 210 215 220 |
| | Val Val Arg Ser Glu Asp Ala Tyr Glu Leu Phe Arg Pro Gly Glu | |
| 35 | Glu | 225 230 235 |
| | 240 | |
| | Val Pro Ser Thr Gly Phe Tyr Lys Ile Asp Leu Ser Arg Phe Tyr | |
| 40 | Pro | 245 250 255 |
| | Lys Asn Asn Val Met Glu Met Gln Cys Asp Arg Thr Leu Glu Pro | |
| 45 | Val | 260 265 270 |
| | Gln Pro Ser Glu Ser Lys Ile Gln | |
| 50 | | 275 280 |

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39

5

Met Glu His Val Ser Ile Lys Thr Leu Tyr His Leu Leu Cys Cys
Met
1 5 10 15

10

Leu Leu Phe Ile Ser Ala Met Cys Ala Leu Ala Gln Glu His Glu
Pro
20 25 30

15

Ile Gly Ala Gln Asp Glu Arg Leu Ser Thr Leu Ile His Gln Arg
Met
35 40 45

20

Gln Glu Ala Lys Val Pro Ala Leu Ser Val Ser Val Thr Ile Lys
Gly
50 55 60

25

Val Arg Gln Arg Phe Val Tyr Gly Val Ala Asp Val Ala Ser Gln
Lys
65 70 75 80

30

Ala Asn Thr Leu Asp Thr Val Tyr Glu Leu Gly Ser Met Ser Lys
Ala
85 90 95

35

Phe Thr Gly Leu Val Val Gln Ile Leu Ile Gln Glu Gly Arg Leu
Arg
100 105 110

40

Gln Gly Asp Asp Ile Ile Thr Tyr Leu Pro Glu Met Arg Leu Asn
Tyr
115 120 125

45

Gln Gly Lys Pro Ala Ser Leu Thr Val Ala Asp Phe Leu Tyr His
Thr
130 135 140

50

| | | |
|----|-------------------------------------------------------------|---------|
| | Ser Gly Leu Pro Phe Ser Thr Leu Ala Arg Leu Glu Asn Pro Met | |
| | Pro | |
| | 145 | 150 155 |
| 5 | 160 | |
| | Gly Ser Ala Val Ala Gln Gln Leu Arg Asn Glu Asn Leu Leu Phe | |
| | Ala | |
| | 165 | 170 175 |
| 10 | | |
| | Pro Gly Ala Lys Phe Ser Tyr Ala Ser Ala Asn Tyr Asp Val Leu | |
| | Gly | |
| | 180 | 185 190 |
| 15 | | |
| | Ala Val Ile Glu Asn Val Thr Gly Lys Thr Phe Thr Glu Val Ile | |
| | Ala | |
| | 195 | 200 205 |
| 20 | | |
| | Glu Arg Leu Thr Gln Pro Leu Gly Met Ser Ala Thr Val Ala Val | |
| | Lys | |
| | 210 | 215 220 |
| 25 | | |
| | Gly Asp Glu Ile Ile Val Asn Lys Ala Ser Gly Tyr Lys Leu Gly | |
| | Phe | |
| | 225 | 230 235 |
| 30 | 240 | |
| | Gly Lys Pro Val Leu Phe His Ala Pro Leu Ala Arg Asn His Val | |
| | Pro | |
| | 245 | 250 255 |
| 35 | | |
| | Ala Ala Tyr Ile His Ser Thr Leu Pro Asp Met Glu Ile Trp Ile | |
| | Asp | |
| | 260 | 265 270 |
| 40 | | |
| | Ala Trp Leu His Arg Lys Ala Leu Pro Ala Thr Leu Arg Glu Ala | |
| | Met | |
| | 275 | 280 285 |
| 45 | | |
| | Ser Asn Ser Trp Arg Gly Asn Ser Asp Val Pro Leu Ala Ala Asp | |
| | Asn | |
| | 290 | 295 300 |
| 50 | | |

| | | | | | | | | | | | | | | | |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | Arg | Ile | Leu | Tyr | Ala | Ser | Gly | Trp | Phe | Ile | Asp | Gln | Asn | Gln | Gly |
| | Pro | | | | | | | | | | | | | | |
| | 305 | | | | | 310 | | | | | 315 | | | | |
| 5 | 320 | | | | | | | | | | | | | | |
| | Tyr | Ile | Ser | His | Gly | Gly | Gln | Asn | Pro | Asn | Phe | Ser | Ser | Cys | Ile |
| | Ala | | | | | | | | | | | | | | |
| 10 | | | | | 325 | | | | | 330 | | | | | 335 |
| | Leu | Arg | Pro | Asp | Gln | Gln | Ile | Gly | Ile | Val | Ala | Leu | Ala | Asn | Met |
| | Asn | | | | | | | | | | | | | | |
| 15 | | | | | 340 | | | | 345 | | | | | 350 | |
| | Ser | Asn | Leu | Ile | Leu | Gln | Leu | Cys | Ala | Asp | Ile | Asp | Asn | Tyr | Leu |
| | Arg | | | | | | | | | | | | | | |
| 20 | | | 355 | | | | | 360 | | | | | 365 | | |
| | Ile | Gly | Lys | Tyr | Ala | Asp | Gly | Ala | Gly | Asp | Ala | Ile | Thr | Ala | Thr |
| | Asp | | | | | | | | | | | | | | |
| 25 | | 370 | | | | | 375 | | | | | 380 | | | |
| | Thr | Leu | Phe | Val | Tyr | Leu | Thr | Leu | Leu | Leu | Cys | Phe | Trp | Gly | Ala |
| | Val | | | | | | | | | | | | | | |
| 30 | 385 | | | | | 390 | | | | | 395 | | | | |
| | 400 | | | | | | | | | | | | | | |
| | Val | Val | Val | Arg | Gly | Ala | Phe | Arg | Val | Tyr | Arg | Ala | Thr | Ala | His |
| | Gly | | | | | | | | | | | | | | |
| 35 | | | | | 405 | | | | | 410 | | | | 415 | |
| | Pro | Gly | Lys | Gln | Gln | Arg | Leu | Arg | Leu | Arg | Val | Arg | Asp | Tyr | Ile |
| | Ile | | | | | | | | | | | | | | |
| 40 | | | | | 420 | | | | 425 | | | | 430 | | |
| | Ala | Leu | Ala | Val | Pro | Gly | Leu | Val | Ala | Ala | Met | Leu | Tyr | Val | Ala |
| | Pro | | | | | | | | | | | | | | |
| 45 | | | 435 | | | | | 440 | | | | 445 | | | |
| | Gly | Ile | Leu | Ser | Pro | Gly | Leu | Asp | Trp | Arg | Phe | Ile | Leu | Val | Trp |
| | Gly | | | | | | | | | | | | | | |
| 50 | | | 450 | | | | 455 | | | | | 460 | | | |

Pro Ser Ser Val Leu Ala Ile Pro Phe Gly Ile Ile Leu Leu Ala
 Phe
 5 465 470 475
 480

Val Leu Thr Leu Asn His Gln Ile Lys Arg Ile Leu Leu His Asn
 10 Lys
 485 490 495

Glu Trp Asp Asp Glu
 15 500

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20 Met Lys Asn Lys Tyr Ile Ile Ala Pro Gly Ile Ala Val Met Cys
 Ser
 1 5 10 15

25 Ala Val Ile Ser Ser Gly Tyr Ala Ser Ser Asp Lys Lys Glu Asp
 Thr
 20 25 30

30 Leu Val Val Thr Ala Ser Gly Phe Thr Gln Gln Leu Arg Asn Ala
 Pro
 35 40 45

35 Ala Ser Val Ser Val Ile Thr Ser Glu Gln Leu Gln Lys Lys Pro
 Val
 50 55 60

40 Ser Asp Leu Val Asp Ala Val Lys Asp Val Glu Gly Ile Ser Ile
 Thr
 65 70 75 80

45 Gly Gly Asn Glu Lys Pro Asp Ile Ser Ile Arg Gly Leu Ser Gly
 Asp
 85 90 95

50

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Tyr Thr Leu Ile Leu Val Asp Gly Arg Arg Gln Ser Gly Arg Glu
 Ser
 100 105 110

5

Arg Pro Asn Gly Ser Gly Gly Phe Glu Ala Gly Phe Ile Pro Pro
 Val
 115 120 125

10

Glu Ala Ile Glu Arg Ile Glu Val Ile Arg Gly Pro Met Ser Ser
 Leu
 130 135 140

15

Tyr Gly Ser Asp Ala Ile Gly Gly Val Ile Asn Ile Ile Thr Lys
 Pro
 145 150 155
 160

20

Val Asn Asn Gln Thr Trp Asp Gly Val Leu Gly Leu Gly Gly Ile
 Ile
 165 170 175

25

Gln Glu His Gly Lys Phe Gly Asn Ser Thr Thr Asn Asp Phe Tyr
 Leu
 180 185 190

30

Ser Gly Pro Leu Ile Lys Asp Lys Leu Gly Leu Gln Leu Tyr Gly
 Gly
 195 200 205

35

Met Asn Tyr Arg Lys Glu Asp Ser Ile Ser Gln Gly Thr Pro Ala
 Lys
 210 215 220

40

Asp Asn Lys Asn Ile Thr Ala Thr Leu Gln Phe Thr Pro Thr Glu
 Ser
 225 230 235
 240

45

Gln Lys Phe Val Phe Glu Tyr Gly Lys Asn Asn Gln Val His Thr
 Leu
 245 250 255

50

10

15

20

25

30

35

40

45

50

Leu Thr Gly Gly Leu Arg Leu Asp Asn His Glu Ile Tyr Gly Ser
Tyr
405 410 415

| | | | | |
|----|-----------------------------------------------------------------|-----|-----|-----|
| 5 | Trp Asn Pro Arg Leu Tyr Ala Val Tyr Asn Leu Thr Asp Asn Leu Thr | 420 | 425 | 430 |
| 10 | Leu Lys Gly Gly Ile Ala Lys Ala Phe Arg Ala Pro Ser Ile Arg Glu | 435 | 440 | 445 |
| 15 | Val Ser Pro Gly Phe Gly Thr Leu Thr Gln Gly Gly Ala Ser Ile Met | 450 | 455 | 460 |
| 20 | Tyr Gly Asn Arg Asp Leu Lys Pro Glu Thr Ser Val Thr Glu Glu Ile | 465 | 470 | 475 |
| | | 480 | | |
| 25 | Gly Ile Ile Tyr Ser Asn Asp Ser Gly Phe Ser Ala Ser Ala Thr Leu | 485 | 490 | 495 |
| 30 | Phe Asn Thr Asp Phe Lys Asn Lys Leu Thr Ser Tyr Asp Ile Gly Thr | 500 | 505 | 510 |
| 35 | Lys Asp Pro Val Thr Gly Leu Asn Thr Phe Ile Tyr Asp Asn Val Gly | 515 | 520 | 525 |
| 40 | Glu Ala Asn Ile Arg Gly Val Glu Leu Ala Thr Gln Ile Pro Val Tyr | 530 | 535 | 540 |
| 45 | Asp Lys Trp His Val Ser Ala Asn Tyr Thr Phe Thr Asp Ser Arg Arg | 545 | 550 | 555 |
| | | 560 | | |
| 50 | Lys Ser Asp Asp Glu Ser Leu Asn Gly Lys Ser Leu Lys Gly Glu Pro | | | |

| | | | | | | | | | | | | | | | |
|----|-------|-----|-------|-----|-----|-------|-----|-------|------------------|-------|-----|-----|-----|-----|-----|
| 5 | Leu | Glu | Arg | Thr | Pro | Arg | His | Ala | Ala | Asn | Ala | Lys | Leu | Glu | Trp |
| | Asp | | | | | | | | | | | | | | |
| | | | | 580 | | | | | 585 | | | | | 590 | |
| 10 | Tyr | Thr | Gln | Asp | Ile | Thr | Phe | Tyr | Ser | Ser | Leu | Asn | Tyr | Thr | Gly |
| | Lys | | | | | | | | | | | | | | |
| | | | 595 | | | | | 600 | | | | | 605 | | |
| 15 | Gln | Ile | Trp | Ala | Ala | Gln | Arg | Asn | Gly | Ala | Lys | Val | Pro | Arg | Val |
| | Arg | | | | | | | | | | | | | | |
| | | 610 | | | | | 615 | | | | | 620 | | | |
| 20 | Asn | Gly | Phe | Thr | Ser | Met | Asp | Ile | Gly | Leu | Asn | Tyr | Gln | Ile | Leu |
| | Pro | | | | | | | | | | | | | | |
| | 625 | | | | | 630 | | | | | 635 | | | | |
| | 640 | | | | | | | | | | | | | | |
| 25 | Asp | Thr | Leu | Ile | Asn | Phe | Ala | Val | Leu | Asn | Val | Thr | Asp | Arg | Lys |
| | Ser | | | | | | | | | | | | | | |
| | | | | | 645 | | | | | 650 | | | | | 655 |
| 30 | Glu | Asp | Ile | Asp | Thr | Ile | Asp | Gly | Asn | Trp | Gln | Val | Asp | Glu | Gly |
| | Arg | | | | | | | | | | | | | | |
| | | | 660 | | | | | 665 | | | | | | 670 | |
| 35 | Arg | Tyr | Trp | Ala | Asn | Val | Arg | Val | Ser | Phe | | | | | |
| | | | 675 | | | | | 680 | | | | | | | |
| 40 | <210> | 41 | <211> | | 164 | <212> | PRT | <213> | Escherichia coli | <400> | | | | | |
| | 41 | | | | | | | | | | | | | | |
| 45 | Met | Gly | Phe | Arg | Lys | Thr | Ile | Ile | Thr | Ser | Val | Gly | Leu | Ile | Phe |
| | Ile | | | | | | | | | | | | | | |
| | 1 | | | | 5 | | | | | 10 | | | | 15 | |
| 50 | Ser | Phe | Ser | Phe | Val | Ala | Lys | Cys | Ser | Gln | Leu | Lys | Asn | Leu | Asn |
| | Asn | | | | | | | | | | | | | | |
| | | | | 20 | | | | | 25 | | | | | 30 | |

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Tyr Ser Val Met Leu Cys Gly Lys Val Ser Asn Asn Ile Leu Asp
 Asp
 35 40 45

5
 Ile Gly Gly Tyr Lys Glu Arg Asn Ile Leu Met Leu Arg Ala Ile
 Lys
 50 55 60

10
 Lys Ile Ile Ile Met Thr Ile Val Asn Ile Ile Phe Phe Tyr Ser
 Phe
 65 70 75 80

15
 Gln Ser Thr Ala Asp Glu Met Val Leu Ile Lys Lys Tyr Gly Phe
 Gly
 85 90 95

20
 Leu Glu Arg Asp Ile Lys Gly Arg Pro Leu Ile Tyr Pro Ile Glu
 Asn
 100 105 110

25
 Tyr Asp Glu Cys Lys Lys Lys Cys Asn His Met Asn Tyr Ile Ala
 Asp
 115 120 125

30
 Val Asn Ala Gln Leu Ala Met Ser Lys Lys Asn Asn Arg Ile Phe
 Ala
 130 135 140

35
 Asn Ile Thr Phe Thr Asn Asn Ser Ser Thr Thr Tyr Phe Phe Leu
 Asn
 145 150 155
 160

40
 Ile Ile Tyr Leu

45
 <210> 42 <211> 218 <212> PRT <213> Escherichia coli <400>
 42

50
 Met Asn Gln Ile Lys Asp Asn Lys Val Ile Met Lys Ile Lys Asn
 Leu
 1 5 10 15

| | | | | | | | | | | | | | | | | |
|----|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| 5 | Ile Tyr | Ser | Val | Ile | Leu | Leu | Ser | Gly | Gly | Ile | Met | Gly | Thr | Gly | Leu | |
| | | | | 20 | | | | | 25 | | | | | 30 | | |
| 10 | Ser Glu | Ser | Asp | Asn | His | Gln | Lys | Ile | Arg | Ser | Arg | Phe | Asn | Ile | Gln | |
| | | | 35 | | | | | 40 | | | | | 45 | | | |
| 15 | Ser Arg | Tyr | Cys | Ala | Ile | Lys | Thr | Asn | Gly | Val | Leu | Gly | Phe | Ser | Asn | |
| | | 50 | | | | | | 55 | | | | | 60 | | | |
| 20 | Lys Ser | Asp | Val | Leu | Arg | Glu | Asn | Gly | Asp | Ser | Thr | Gly | Thr | Thr | Ser | |
| | 65 | | | | | 70 | | | | | 75 | | | | 80 | |
| 25 | Ser Ser | Thr | Asn | Ala | Met | Met | Leu | Met | Glu | Asn | Gly | Glu | Asn | Glu | Ile | |
| | | | | 85 | | | | | | 90 | | | | 95 | | |
| 30 | Leu Thr | Glu | Ile | Gly | Ala | Leu | Arg | Trp | Phe | Ser | Asp | Lys | Pro | Ala | Ser | |
| | | | | 100 | | | | | 105 | | | | | 110 | | |
| 35 | Glu Leu | Glu | Arg | Gly | His | Phe | Ser | Gln | Lys | Ala | Gly | Cys | Ser | Leu | Asp | |
| | | | 115 | | | | | 120 | | | | | 125 | | | |
| 40 | Val Val | Arg | Phe | Val | Lys | Gln | Glu | Glu | Thr | Ile | Leu | Ser | Ser | Ile | Lys | |
| | | 130 | | | | | 135 | | | | | 140 | | | | |
| 45 | Thr His | Ile | Asn | Gln | Gln | Gly | Ile | Pro | Glu | Ala | Gln | Pro | Asp | Ser | Met | |
| | 145 160 | | | | | 150 | | | | | 155 | | | | | |
| 50 | Pro Phe | Val | Ile | Arg | Lys | Glu | Ile | Leu | Ala | Glu | Gln | Ala | Glu | Pro | Gly | |
| | | | | | 165 | | | | | 170 | | | | 175 | | |

Ile Asp Pro Asp Tyr Phe Asn Glu Thr Tyr Phe Pro Lys Gly Met
 Lys
 5 180 185 190

Val Tyr Gln Phe Thr Gln Lys Val Ser Val Ala Gly Leu Pro Asp
 Gly
 10 195 200 205

Pro Gly Arg Ser Thr Pro Phe Thr Gly Ala
 210 215
 15

<210> 43 <211> 2732 <212> PRT <213> Escherichia coli
 <400> 43

20 Met His Gln Pro Pro Val Arg Phe Thr Tyr Arg Leu Leu Ser Tyr
 Leu
 1 5 10 15

25 Val Ser Ala Ile Ile Ala Gly Gln Pro Leu Leu Pro Ala Val Gly
 Ala
 20 25 30

30 Val Ile Thr Pro Gln Asn Gly Ala Gly Met Asp Lys Ala Ala Asn
 Gly
 35 40 45

35 Val Pro Val Val Asn Ile Ala Thr Pro Asn Gly Ala Gly Ile Ser
 His
 50 55 60

40 Asn Arg Phe Thr Asp Tyr Asn Val Gly Lys Glu Gly Leu Ile Leu
 Asn
 65 70 75 80

45 Asn Ala Thr Gly Lys Leu Asn Pro Thr Gln Leu Gly Gly Leu Ile
 Gln
 85 90 95

50 Asn Asn Pro Asn Leu Lys Ala Gly Gly Glu Ala Lys Gly Ile Ile
 Asn

100

105

110

5 Glu Val Thr Gly Gly Lys Arg Ser Leu Leu Gln Gly Tyr Thr Glu
Val

115

120

125

10 Ala Gly Lys Ala Ala Asn Val Met Val Ala Asn Pro Tyr Gly Ile
Thr

130

135

140

15 Cys Asp Gly Cys Gly Phe Ile Asn Thr Pro His Ala Thr Leu Thr
Thr

145

150

155

160

20 Gly Lys Pro Val Met Asn Ala Asp Gly Ser Leu Gln Ala Leu Glu
Val

165

170

175

25 Thr Glu Gly Ser Ile Thr Ile Asn Gly Ala Gly Leu Asp Gly Thr
Arg

180

185

190

30 Ser Asp Ala Val Ser Ile Ile Ala Arg Ala Thr Glu Val Asn Ala
Ala

195

200

205

35 Leu His Ala Lys Asp Leu Thr Val Thr Ala Gly Ala Asn Arg Val
Thr

210

215

220

40 Ala Asp Gly Arg Val Arg Ala Leu Lys Gly Glu Gly Asp Val Pro
Lys

225

230

235

240

45 Val Ala Val Asp Thr Gly Ala Leu Gly Gly Met Tyr Ala Arg Arg
Ile

245

250

255

50

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His Leu Thr Ser Thr Glu Ser Gly Val Gly Val Asn Leu Gly Asn
 Leu
 260 265 270

5 Tyr Ala Arg Asp Gly Asp Ile Thr Leu Asp Ala Ser Gly Arg Leu
 Thr
 275 280 285

10 Val Asn Asn Ser Leu Ala Thr Gly Ala Val Thr Ala Lys Gly Gln
 Gly
 290 295 300

15 Val Thr Leu Thr Gly Asp His Lys Ala Gly Gly Asn Leu Ser Val
 Ser
 305 310 315
 320

20 Ser Arg Arg Asp Ile Val Leu Ser Asn Gly Thr Leu Asn Ser Asp
 Lys
 325 330 335

25 Asp Leu Ser Leu Thr Ala Gly Gly Arg Ile Thr Gln Gln Asn Glu
 Lys
 340 345 350

30 Leu Thr Ala Gly Arg Asp Val Thr Leu Ala Ala Lys Asn Ile Thr
 Gln
 355 360 365

35 Asp Thr Ala Ser Gln Ile Asn Ala Ala Arg Asp Ile Val Thr Val
 Ala
 370 375 380

40 Ser Asp Thr Leu Thr Thr Gln Gly Gln Ile Thr Ala Gly Gln Asn
 Leu
 385 390 395

45 Thr Ala Ser Ala Thr Thr Leu Thr Gln Asp Gly Ile Leu Leu Ala
 Lys
 405 410 415

| | | | | | | | | | | | | | | | | |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| | Ser | His | Ala | Gly | Leu | Asn | Ala | Gly | Thr | Leu | Asn | Asn | Ser | Gly | Ala | |
| | Val | | | | | | | | | | | | | | | |
| 5 | | | | 420 | | | | | 425 | | | | | | 430 | |
| | Gln | Gly | Ala | Thr | Leu | Thr | Leu | Gly | Ser | Thr | Thr | Leu | Ser | Asn | Ser | |
| | Gly | | | | | | | | | | | | | | | |
| 10 | | | 435 | | | | | 440 | | | | | 445 | | | |
| | Ser | Leu | Leu | Ser | Gly | Gly | Pro | Leu | Thr | Met | Asn | Thr | Arg | Asp | Phe | |
| | Thr | | | | | | | | | | | | | | | |
| 15 | | 450 | | | | | 455 | | | | | 460 | | | | |
| | Gln | Ser | Gly | Arg | Thr | Gly | Ala | Lys | Gly | Lys | Val | Asp | Ile | Met | Ala | |
| | Ser | | | | | | | | | | | | | | | |
| 20 | 465 | | | | | 470 | | | | | | 475 | | | | |
| | 480 | | | | | | | | | | | | | | | |
| | Gly | Lys | Leu | Thr | Ser | Thr | Gly | Leu | Leu | Val | Thr | Met | His | Leu | Val | |
| | Leu | | | | | | | | | | | | | | | |
| 25 | | | | 485 | | | | | | 490 | | | | | 495 | |
| | Lys | Ala | Gln | Asp | Val | Thr | Gln | Asn | Gly | Val | Leu | Ser | Gly | Gly | Lys | |
| | Gly | | | | | | | | | | | | | | | |
| 30 | | | 500 | | | | | | 505 | | | | | 510 | | |
| | Leu | Thr | Val | Ser | Ala | Thr | Ser | Ser | Gly | Lys | Lys | Ser | Val | Thr | His | |
| | Ser | | | | | | | | | | | | | | | |
| 35 | | 515 | | | | | | 520 | | | | | 525 | | | |
| | Asp | Ala | Ala | Met | Thr | Leu | Asn | Val | Thr | Thr | Val | Ala | Leu | Asp | Gly | |
| | Glu | | | | | | | | | | | | | | | |
| 40 | | 530 | | | | | 535 | | | | | 540 | | | | |
| | Thr | Ser | Ala | Gly | Asp | Thr | Leu | Arg | Val | Gln | Ala | Asp | Lys | Leu | Ser | |
| | Thr | | | | | | | | | | | | | | | |
| 45 | 545 | | | | | 550 | | | | | 555 | | | | | |
| | 560 | | | | | | | | | | | | | | | |
| | Ala | Ala | Gly | Ala | Gln | Leu | Gln | Ser | Gly | Lys | Asn | Leu | Ser | Ile | Asn | |
| | Ala | | | | | | | | | | | | | | | |
| 50 | | | | 565 | | | | | | 570 | | | | | 575 | |

| | | | | | | | | | | | | | | | | |
|----|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 5 | Arg Val | Asp | Ala | Arg | Leu | Ala | Gly | Thr | Gln | Ala | Ala | Gln | Gln | Thr | Met | |
| | | | | | 580 | | | | 585 | | | | | 590 | | |
| 10 | Val Pro | Asn | Ala | Ser | Glu | Lys | Leu | Thr | His | Ser | Gly | Lys | Ser | Ser | Ala | |
| | | | | | 595 | | | 600 | | | | | | 605 | | |
| 15 | Ser Val | Leu | Ser | Leu | Ser | Ala | Pro | Glu | Leu | Thr | Ser | Ser | Gly | Val | Leu | |
| | | | | | 610 | | | 615 | | | | | | 620 | | |
| 20 | Gly Leu | Ser | Ala | Leu | Asn | Thr | Gln | Ser | Gln | Thr | Leu | Thr | Asn | Ser | Gly | |
| | 625 | | | | | | 630 | | | | | | | 635 | | |
| | 640 | | | | | | | | | | | | | | | |
| 25 | Leu Asn | Gln | Gly | Glu | Ala | Ser | Leu | Thr | Val | Asn | Thr | Gln | Arg | Leu | Asp | |
| | | | | | | | 645 | | | | | 650 | | | 655 | |
| 30 | Gln Ile | Gln | Asn | Gly | Thr | Leu | Tyr | Ser | Ala | Ala | Asp | Leu | Thr | Leu | Asp | |
| | | | | | | | 660 | | | | | 665 | | | 670 | |
| 35 | Pro Met | Asp | Ile | Arg | Asn | Ser | Gly | Leu | Ile | Thr | Gly | Asp | Asn | Gly | Leu | |
| | | | | | | | 675 | | | | | 680 | | | 685 | |
| 40 | Leu Thr | Asn | Ala | Val | Ser | Leu | Ser | Asn | Pro | Gly | Lys | Ile | Ile | Ala | Asp | |
| | | | | | | | 690 | | | | | 695 | | | 700 | |
| 45 | Leu Gly | Ser | Val | Arg | Ala | Thr | Thr | Leu | Asp | Gly | Asp | Gly | Leu | Leu | Gln | |
| | 705 | | | | | | | | | | | | | | 710 | |
| | 720 | | | | | | | | | | | | | | | 715 |
| 50 | Ala His | Gly | Ala | Leu | Ala | Leu | Ala | Gly | Asp | Thr | Leu | Ser | Gln | Gly | Ser | |

| | | | | | | |
|----|----------------------------------------------------------------------------------|-----|-----|-----|-----|-----|
| | | 725 | | 730 | | 735 |
| 5 | Gly Arg Trp Leu Thr Ala Asp Asp Leu Ser Leu Arg Gly Lys Thr Leu | 740 | | 745 | | 750 |
| 10 | Asn Thr Ala Gly Thr Thr Gln Gly Gln Asn Ile Thr Val Gln Ala Asp | 755 | | 760 | | 765 |
| 15 | Arg Trp Ala Asn Ser Gly Ser Val Leu Ala Thr Gly Asn Leu Thr Ala | 770 | | 775 | | 780 |
| 20 | Ser Ala Thr Gly Gln Leu Thr Ser Thr Gly Asp Ile Met Ser Gln Gly 785 800 | | 790 | | 795 | |
| 25 | Asp Thr Thr Leu Lys Ala Ala Thr Thr Asp Asn Arg Gly Ser Leu Leu | | 805 | | 810 | 815 |
| 30 | Ser Ala Gly Thr Leu Ser Leu Asp Gly Asn Ser Leu Asp Asn Arg Gly | 820 | | 825 | | 830 |
| 35 | Thr Val Gln Gly Asn His Val Thr Ile Arg Gln Asn Ser Val Thr Asn | 835 | | 840 | | 845 |
| 40 | Ser Gly Thr Leu Thr Gly Ile Ala Ala Leu Thr Leu Ala Ala Arg Met | 850 | | 855 | | 860 |
| 45 | Ala Ser Pro Gln Pro Ala Leu Met Asn Asn Gly Gly Ser Leu Leu Thr 865 880 | | 870 | | 875 | |
| 50 | | | | | | |

Ser Gly Asp Leu Thr Ile Thr Ala Gly Ser Ile Thr Ser Ser Gly
 His
 885 890 895

5

Trp Gln Gly Lys Arg Val Leu Ile Thr Ala Asp Ser Leu Ala Asn
 Ser
 900 905 910

10

Gly Ala Ile Gln Ala Ala Asp Ser Leu Thr Ala Arg Leu Thr Gly
 Glu
 915 920 925

15

Leu Val Ser Thr Ala Gly Ser Lys Val Thr Ser Asn Gly Glu Met
 Ala
 930 935 940

20

Leu Ser Ala Leu Asn Leu Ser Asn Ser Gly Gln Trp Ile Ala Lys
 Asn
 945 950 955
 960

25

Leu Thr Leu Lys Ala Asn Ser Leu Thr Ser Ala Gly Asp Ile Thr
 Gly
 965 970 975

30

Val Asp Thr Leu Thr Leu Thr Val Asn Gln Thr Leu Asn Asn Gln
 Ala
 980 985 990

35

Asn Gly Lys Leu Leu Ser Ala Gly Val Leu Thr Leu Lys Ala Asp
 Ser
 995 1000 1005

40

Val Thr Asn Asp Gly Gln Leu Gln Gly Asn Val Thr Thr Ile Thr
 1010 1015 1020

45

Ala Gly Gln Leu Thr Asn Gly Gly His Leu Gln Gly Glu Thr Leu
 1025 1030 1035

50

Thr Leu Thr Ala Ser Gly Gly Val Asn Asn Arg Ser Gly Gly Val
 1040 1045 1050

5 Leu Met Ser Arg Asn Ala Leu Asn Val Ser Thr Ala Thr Leu Ser
 1055 1060 1065
 Asn Gln Ser Thr Ile Gln Gly Gly Gly Gly Val Ser Leu Asn Ala
 1070 1075 1080
 10 Thr Asp Arg Leu Gln Asn Asp Gly Lys Ile Leu Ser Gly Ser Asn
 1085 1090 1095
 15 Leu Thr Leu Thr Ala Gln Val Leu Ala Asn Thr Gly Ser Gly Leu
 1100 1105 1110
 20 Val Gln Ala Ala Thr Leu Leu Leu Asp Val Val Asn Thr Val Asn
 1115 1120 1125
 25 Gly Gly Arg Val Leu Ala Thr Gly Ser Asp Val Lys Gly Thr Thr
 1130 1135 1140
 Leu Asn Asn Thr Gly Thr Leu Gln Gly Ala Thr Leu Val Asn Tyr
 1145 1150 1155
 30 His Thr Phe Ser Ser Gly Thr Leu Leu Gly Thr Ser Gly Leu Gly
 1160 1165 1170
 35 Val Lys Gly Ser Ser Leu Leu Gln Asn Gly Thr Gly Arg Leu Tyr
 1175 1180 1185
 40 Ser Ala Gly Asn Leu Leu Leu Asp Ala Gln Asp Phe Ser Gly Gln
 1190 1195 1200
 45 Gly Gln Val Val Ala Thr Gly Asp Val Thr Leu Lys Leu Ile Ala
 1205 1210 1215
 Ala Leu Thr Asn His Gly Thr Leu Ala Ala Gly Lys Thr Leu Ser
 1220 1225 1230
 50 Val Thr Ser Gln Asn Ala Ile Thr Asn Gly Gly Val Met Gln Gly

| | 1235 | | 1240 | | 1245 | |
|----|-------------------------------------------------------------------------------|--|------|--|------|--|
| 5 | Asp Ala Met Val Leu Gly Ala Gly Glu Ala Phe Thr Asn Asn Gly 1250 1255 1260 | | | | | |
| 10 | Leu Thr Ala Gly Lys Gly Asn Ser Val Phe Ser Ala Gln Arg Leu 1265 1270 1275 | | | | | |
| 15 | Phe Leu Asn Ala Pro Gly Ser Leu Gln Gly Gly Gly Asp Val Ser 1280 1285 1290 | | | | | |
| 20 | Leu Asn Ser Arg Ser Asp Ile Thr Ile Ser Gly Phe Thr Gly Thr 1295 1300 1305 | | | | | |
| 25 | Ala Gly Ser Leu Thr Met Asn Val Ala Gly Thr Leu Leu Asn Ser 1310 1315 1320 | | | | | |
| 30 | Ala Leu Ile Tyr Ala Gly Asn Asn Leu Lys Leu Phe Thr Asp Arg 1325 1330 1335 | | | | | |
| 35 | Leu His Asn Gln His Gly Asp Ile Leu Ala Gly Asn Ser Leu Trp 1340 1345 1350 | | | | | |
| 40 | Val Gln Lys Asp Ala Ser Gly Gly Ala Asn Thr Glu Ile Ile Asn 1355 1360 1365 | | | | | |
| 45 | Asn Ser Gly Asn Ile Glu Thr His Gln Gly Asp Ile Val Val Arg 1370 1375 1380 | | | | | |
| 50 | Thr Gly His Leu Leu Asn Gln Arg Glu Gly Phe Ser Ala Thr Thr 1385 1390 1395 | | | | | |
| | Thr Thr Arg Thr Asn Pro Ser Ser Ile Gln Gly Met Gly Asn Ala 1400 1405 1410 | | | | | |
| | Leu Val Asp Ile Pro Leu Ser Leu Leu Pro Asp Gly Ser Tyr Gly 1415 1420 1425 | | | | | |

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| | | | | | | | | | | | | | | | |
|----|------|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|------|-----|-----|-----|
| | Tyr | Phe | Thr | Arg | Glu | Val | Glu | Asn | Gln | His | Gly | Thr | Pro | Cys | Asn |
| | 1430 | | | | | | 1435 | | | | | 1440 | | | |
| 5 | Gly | His | Gly | Ala | Cys | Asn | Ile | Thr | Met | Asp | Thr | Leu | Tyr | Tyr | Tyr |
| | 1445 | | | | | | 1450 | | | | | 1455 | | | |
| 10 | Ala | Pro | Phe | Ala | Asp | Ser | Ala | Thr | Gln | Arg | Phe | Leu | Ser | Ser | Gln |
| | 1460 | | | | | | 1465 | | | | | 1470 | | | |
| 15 | Asn | Ile | Thr | Thr | Val | Thr | Gly | Ala | Asp | Asn | Pro | Ala | Gly | Arg | Ile |
| | 1475 | | | | | | 1480 | | | | | 1485 | | | |
| 20 | Ala | Ser | Gly | Arg | Asn | Leu | Ser | Ala | Glu | Ala | Glu | Arg | Leu | Glu | Asn |
| | 1490 | | | | | | 1495 | | | | | 1500 | | | |
| 25 | Arg | Ala | Ser | Phe | Ile | Leu | Ala | Asn | Gly | Asp | Ile | Ala | Leu | Ser | Gly |
| | 1505 | | | | | | 1510 | | | | | 1515 | | | |
| 30 | Arg | Glu | Leu | Ser | Asn | Gln | Ser | Trp | Gln | Thr | Gly | Thr | Glu | Asn | Glu |
| | 1520 | | | | | | 1525 | | | | | 1530 | | | |
| 35 | Tyr | Leu | Val | Tyr | Arg | Tyr | Asp | Pro | Lys | Thr | Phe | Tyr | Gly | Ser | Tyr |
| | 1535 | | | | | | 1540 | | | | | 1545 | | | |
| 40 | Ala | Thr | Gly | Ser | Leu | Asp | Lys | Leu | Pro | Leu | Leu | Ser | Pro | Glu | Phe |
| | 1550 | | | | | | 1555 | | | | | 1560 | | | |
| 45 | Glu | Asn | Asn | Thr | Ile | Arg | Phe | Ser | Leu | Asp | Gly | Arg | Glu | Lys | Asp |
| | 1565 | | | | | | 1570 | | | | | 1575 | | | |
| 50 | Tyr | Thr | Pro | Gly | Lys | Thr | Tyr | Tyr | Ser | Val | Ile | Gln | Ala | Gly | Gly |
| | 1580 | | | | | | 1585 | | | | | 1590 | | | |
| 55 | Asp | Val | Lys | Thr | Arg | Phe | Thr | Ser | Ser | Ile | Asn | Asn | Gly | Thr | Thr |
| | 1595 | | | | | | 1600 | | | | | 1605 | | | |
| 60 | Thr | Ala | His | Ala | Gly | Ser | Val | Ser | Pro | Val | Val | Ser | Ala | Pro | Val |
| | 1610 | | | | | | 1615 | | | | | 1620 | | | |

| | | | | | | | | | | | | | | | |
|----|------|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|------|-----|-----|-----|
| | Leu | Asn | Thr | Leu | Ser | Gln | Gln | Thr | Gly | Gly | Asp | Ser | Leu | Thr | Gln |
| | 1625 | | | | | | 1630 | | | | | 1635 | | | |
| 5 | Thr | Ala | Leu | Gln | Gln | Tyr | Glu | Pro | Val | Val | Val | Gly | Ser | Pro | Gln |
| | 1640 | | | | | | 1645 | | | | | 1650 | | | |
| 10 | Trp | His | Asp | Glu | Leu | Ala | Gly | Ala | Leu | Lys | Asn | Ile | Ala | Gly | Gly |
| | 1655 | | | | | | 1660 | | | | | 1665 | | | |
| 15 | Ser | Pro | Leu | Thr | Gly | Gln | Thr | Gly | Ile | Ser | Asp | Asp | Trp | Pro | Leu |
| | 1670 | | | | | | 1675 | | | | | 1680 | | | |
| 20 | Pro | Ser | Gly | Asn | Asn | Gly | Tyr | Leu | Val | Pro | Ser | Thr | Asp | Pro | Asp |
| | 1685 | | | | | | 1690 | | | | | 1695 | | | |
| 25 | Ser | Pro | Tyr | Leu | Ile | Thr | Val | Asn | Pro | Lys | Leu | Asp | Gly | Leu | Gly |
| | 1700 | | | | | | 1705 | | | | | 1710 | | | |
| 30 | Gln | Val | Asp | Ser | His | Leu | Phe | Ala | Gly | Leu | Tyr | Glu | Leu | Leu | Gly |
| | 1715 | | | | | | 1720 | | | | | 1725 | | | |
| 35 | Ala | Lys | Pro | Gly | Gln | Ala | Pro | Arg | Glu | Thr | Ala | Pro | Ser | Tyr | Thr |
| | 1730 | | | | | | 1735 | | | | | 1740 | | | |
| 40 | Asp | Glu | Lys | Gln | Phe | Leu | Gly | Ser | Ser | Tyr | Phe | Leu | Asp | Arg | Leu |
| | 1745 | | | | | | 1750 | | | | | 1755 | | | |
| 45 | Gly | Leu | Lys | Pro | Glu | Lys | Asp | Tyr | Arg | Phe | Leu | Gly | Asp | Ala | Val |
| | 1760 | | | | | | 1765 | | | | | 1770 | | | |
| 50 | Phe | Asp | Thr | Arg | Tyr | Val | Ser | Asn | Ala | Val | Leu | Ser | Arg | Thr | Gly |
| | 1775 | | | | | | 1780 | | | | | 1785 | | | |
| 55 | Ser | Arg | Tyr | Leu | Asn | Gly | Leu | Gly | Ser | Asp | Thr | Glu | Gln | Met | Arg |
| | 1790 | | | | | | 1795 | | | | | 1800 | | | |
| 60 | Tyr | Leu | Met | Asp | Asn | Ala | Ala | Arg | Gln | Gln | Lys | Gly | Leu | Gly | Leu |
| | 1805 | | | | | | 1810 | | | | | 1815 | | | |

| | | | | | | | | | | | | | | | |
|----|-------------|-----|-----|-----|-----|-----|-------------|-----|-----|-----|-----|-------------|-----|-----|-----|
| 5 | Glu 1820 | Phe | Gly | Val | Ala | Leu | Thr 1825 | Ala | Glu | Gln | Ile | Ala 1830 | Gln | Leu | Asp |
| 10 | Gly 1835 | Ser | Ile | Leu | Trp | Trp | Glu 1840 | Ser | Val | Thr | Ile | Asn 1845 | Gly | Gln | Thr |
| 15 | Val 1850 | Met | Val | Pro | Lys | Leu | Tyr 1855 | Leu | Ser | Pro | Glu | Asp 1860 | Ile | Thr | Leu |
| 20 | His 1865 | Asn | Gly | Ser | Val | Ile | Ser 1870 | Gly | Asn | Asn | Val | Gln 1875 | Leu | Ala | Gly |
| 25 | Gly 1880 | Asn | Ile | Thr | Asn | Ser | Gly 1885 | Gly | Ser | Ile | Asn | Ala 1890 | Gln | Asn | Asp |
| 30 | Leu 1895 | Ser | Leu | Asp | Ser | Ser | Gly 1900 | Tyr | Ile | Asp | Asn | Leu 1905 | Asn | Ala | Gly |
| 35 | Leu 1910 | Ile | Ser | Ala | Gly | Gly | Ser 1915 | Leu | Asp | Leu | Ser | Ala 1920 | Ile | Gly | Asp |
| 40 | Ile 1925 | Ser | Asn | Ile | Ser | Ser | Val 1930 | Ile | Ser | Gly | Lys | Thr 1935 | Val | Gln | Leu |
| 45 | Glu 1940 | Ser | Val | Ser | Gly | Asn | Ile 1945 | Ser | Asn | Ile | Thr | Arg 1950 | Arg | Gln | Gln |
| 50 | Trp 1955 | Asn | Ala | Gly | Ser | Asp | Ser 1960 | Gln | Tyr | Gly | Gly | Val 1965 | His | Leu | Ser |
| 55 | Gly 1970 | Thr | Asp | Thr | Gly | Pro | Val 1975 | Ala | Thr | Ile | Lys | Gly 1980 | Thr | Asp | Ser |
| 60 | Leu 1985 | Ser | Leu | Asp | Ala | Gly | Lys 1990 | Asn | Ile | Asp | Ile | Thr 1995 | Gly | Ala | Thr |
| 65 | Val 2000 | Ser | Ser | Gly | Gly | Asp | Leu 2005 | Gly | Met | Ser | Ala | Gly 2010 | Asn | Asp | Ile |

| | 2000 | | 2005 | | 2010 |
|----|-------------------------------------------------------------------------------|--|------|--|------|
| 5 | Asn Ile Ala Ala Asn Leu Ile Ser Gly Ser Lys Ser Gln Ser Gly 2015 2020 2025 | | | | |
| 10 | Phe Trp His Thr Asp Asp Asn Ser Ser Ser Ser Thr Thr Ser Gln 2030 2035 2040 | | | | |
| 15 | Gly Ser Ser Ile Ser Ala Gly Gly Asn Leu Ala Met Ala Ala Gly 2045 2050 2055 | | | | |
| 20 | His Asn Leu Asp Val Thr Ala Ser Ser Val Ser Ala Gly His Ser 2060 2065 2070 | | | | |
| 25 | Ala Leu Leu Ser Cys Arg Ser Arg Pro Ser Leu Glu Cys Ser Gln 2075 2080 2085 | | | | |
| 30 | Gly Lys Ala Lys Thr Ser Arg Asn Gly Arg Ser Glu Ser His Glu 2090 2095 2100 | | | | |
| 35 | Ser His Ala Ala Val Ser Thr Val Thr Ala Gly Asp Asn Phe Leu 2105 2110 2115 | | | | |
| 40 | Leu Val Ala Gly Arg Asp Ile Ala Ser Gln Ala Ala Gly Met Ala 2120 2125 2130 | | | | |
| 45 | Ala Glu Asn Asn Val Val Ile Arg Gly Gly Arg Asp Val Asn Leu 2135 2140 2145 | | | | |
| 50 | Val Ala Glu Ser Ala Gly Ala Gly Asp Ser Tyr Thr Ser Lys Lys 2150 2155 2160 | | | | |
| | Lys Lys Glu Ile Asn Glu Thr Val Arg Gln Gln Gly Thr Glu Ile 2165 2170 2175 | | | | |
| | Ala Ser Gly Gly Asp Thr Thr Val Asn Ala Gly Arg Asp Ile Thr 2180 2185 2190 | | | | |

| | | | | | | | | | | | | | | | |
|----|------|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|------|-----|-----|-----|
| | Ala | Val | Ala | Ser | Ser | Val | Thr | Ala | Thr | Gly | Asn | Ile | Ser | Val | Asn |
| | 2195 | | | | | | 2200 | | | | | 2205 | | | |
| 5 | Ala | Gly | Arg | Asp | Val | Ala | Leu | Thr | Thr | Ala | Thr | Glu | Ser | Asp | Tyr |
| | 2210 | | | | | | 2215 | | | | | 2220 | | | |
| 10 | His | Tyr | Leu | Glu | Thr | Lys | Lys | Lys | Ser | Gly | Gly | Phe | Leu | Ser | Lys |
| | 2225 | | | | | | 2230 | | | | | 2235 | | | |
| 15 | Lys | Thr | Thr | Arg | Thr | Ile | Ser | Glu | Asp | Ser | Ala | Thr | Arg | Glu | Ala |
| | 2240 | | | | | | 2245 | | | | | 2250 | | | |
| 20 | Gly | Ser | Leu | Leu | Ser | Gly | Asn | Arg | Val | Thr | Val | Asn | Ala | Gly | Asp |
| | 2255 | | | | | | 2260 | | | | | 2265 | | | |
| 25 | Asn | Leu | Thr | Val | Glu | Gly | Ser | Asp | Val | Val | Ala | Asp | Arg | Asp | Val |
| | 2270 | | | | | | 2275 | | | | | 2280 | | | |
| 30 | Ser | Leu | Ala | Ala | Gly | Asn | His | Val | Asp | Val | Leu | Ala | Ala | Thr | Ser |
| | 2285 | | | | | | 2290 | | | | | 2295 | | | |
| 35 | Thr | Asp | Thr | Ser | Trp | Arg | Phe | Lys | Glu | Thr | Lys | Lys | Ser | Gly | Leu |
| | 2300 | | | | | | 2305 | | | | | 2310 | | | |
| 40 | Met | Gly | Thr | Gly | Gly | Ile | Gly | Phe | Thr | Ile | Gly | Ser | Ser | Lys | Thr |
| | 2315 | | | | | | 2320 | | | | | 2325 | | | |
| 45 | Thr | His | Asp | Arg | Arg | Glu | Ala | Gly | Thr | Thr | Gln | Ser | Gln | Ser | Ala |
| | 2330 | | | | | | 2335 | | | | | 2340 | | | |
| 50 | Ser | Thr | Ile | Gly | Ser | Thr | Ala | Gly | Asn | Val | Ser | Ile | Thr | Ala | Gly |
| | 2345 | | | | | | 2350 | | | | | 2355 | | | |
| 55 | Lys | Gln | Ala | His | Ile | Ser | Gly | Ser | Asp | Val | Ile | Ala | Asn | Arg | Asp |
| | 2360 | | | | | | 2365 | | | | | 2370 | | | |
| 60 | Ile | Ser | Ile | Thr | Gly | Asp | Ser | Val | Val | Val | Asp | Pro | Gly | His | Asp |
| | 2375 | | | | | | 2380 | | | | | 2385 | | | |

| | | | | | | | | | | | | | | | |
|----|------|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|------|-----|-----|-----|
| | Arg | Arg | Thr | Val | Asp | Glu | Lys | Phe | Glu | Gln | Lys | Lys | Ser | Gly | Leu |
| | 2390 | | | | | | 2395 | | | | | 2400 | | | |
| 5 | Thr | Val | Ala | Leu | Ser | Gly | Thr | Val | Gly | Ser | Ala | Ile | Asn | Asn | Ala |
| | 2405 | | | | | | 2410 | | | | | 2415 | | | |
| 10 | Val | Thr | Ser | Ala | Gln | Glu | Thr | Lys | Glu | Ser | Ser | Asp | Ser | Arg | Leu |
| | 2420 | | | | | | 2425 | | | | | 2430 | | | |
| 15 | Lys | Ala | Leu | Gln | Ala | Thr | Lys | Thr | Ala | Leu | Ser | Gly | Val | Gln | Ala |
| | 2435 | | | | | | 2440 | | | | | 2445 | | | |
| 20 | Gly | Gln | Ala | Ala | Thr | Met | Ala | Ser | Ala | Thr | Gly | Asp | Pro | Asn | Ala |
| | 2450 | | | | | | 2455 | | | | | 2460 | | | |
| 25 | Gly | Val | Ser | Leu | Ser | Leu | Thr | Thr | Gln | Lys | Ser | Lys | Ser | Gln | Gln |
| | 2465 | | | | | | 2470 | | | | | 2475 | | | |
| 30 | His | Ser | Glu | Ser | Asp | Thr | Val | Ser | Gly | Ser | Thr | Leu | Asn | Ala | Gly |
| | 2480 | | | | | | 2485 | | | | | 2490 | | | |
| 35 | Asn | Asn | Leu | Ser | Val | Val | Ala | Thr | Gly | Lys | Asn | Arg | Gly | Asp | Asn |
| | 2495 | | | | | | 2500 | | | | | 2505 | | | |
| 40 | Arg | Gly | Asp | Ile | Val | Ile | Ala | Gly | Ser | Gln | Leu | Lys | Ala | Gly | Gly |
| | 2510 | | | | | | 2515 | | | | | 2520 | | | |
| 45 | Asn | Thr | Ser | Leu | Asp | Ala | Ala | Asn | Asp | Ile | Leu | Leu | Ser | Gly | Ala |
| | 2525 | | | | | | 2530 | | | | | 2535 | | | |
| 50 | Ala | Asn | Thr | Gln | Lys | Thr | Thr | Gly | Arg | Asn | Ser | Ser | Ser | Gly | Gly |
| | 2540 | | | | | | 2545 | | | | | 2550 | | | |
| 55 | Gly | Val | Gly | Val | Ser | Ile | Gly | Ala | Gly | Lys | Gly | Ala | Gly | Ile | Ser |
| | 2555 | | | | | | 2560 | | | | | 2565 | | | |
| 60 | Ala | Phe | Ala | Ser | Val | Asn | Ala | Ala | Lys | Gly | Arg | Glu | Lys | Gly | Asn |
| | 2570 | | | | | | 2575 | | | | | 2580 | | | |

5 Gly Thr Thr Thr Asp Lys Thr Val Thr Ile Asn Ser Gly Arg Asp
 2585 2590 2595
 Thr Val Leu Asn Gly Ala Gln Val Asn Gly Asn Arg Ile Ile Ala
 2600 2605 2610
 10 Asp Val Gly His Asp Leu Leu Ile Ser Ser Gln Gln Asp Thr Ser
 2615 2620 2625
 15 Lys Tyr Asp Ser Lys Gln Thr Ser Val Ala Ala Gly Gly Ser Phe
 2630 2635 2640
 20 Thr Phe Gly Ser Met Thr Gly Ser Gly Tyr Ile Ala Ala Ser Arg
 2645 2650 2655
 Asp Lys Met Lys Ser Arg Phe Asp Ser Val Ala Glu Gln Thr Gly
 2660 2665 2670
 25 Met Phe Ala Arg Val Met Val Ala Ser Thr Ser Gln Trp Val Asn
 2675 2680 2685
 30 Ile Pro Asn Trp Met Val Arg Ser Leu Pro His Cys His Thr Gly
 2690 2695 2700
 35 Glu Lys Pro Pro Gly Tyr Arg Thr Leu Gly Leu Val Thr Leu Gln
 2705 2710 2715
 40 Arg Ser Gly Ile Ile Lys Ser Ser His Arg Trp Asn Gln Ser
 2720 2725 2730
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 45 Met Met Leu Lys Lys Thr Ile Phe Ile Leu Thr Leu Phe Ser Gly
 Asn
 1 5 10 15
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Val Ile Ala Ala Thr Val Glu Leu Gly Phe Glu Asn Glu Gln Tyr
 Asn
 20 25 30

5 Tyr Ala Tyr Arg Ser Ala Asp Val Phe Met Pro Tyr Ile Lys Ser
 Asn
 35 40 45

10 Phe Asn Pro Val Thr Asp Ser Ala Leu Asn Val Ser Leu Thr Tyr
 Met
 50 55 60

15 Tyr Gln Asp Gln Tyr Gly Lys Lys His Lys Lys Thr Ser Glu Asp
 Arg
 65 70 75 80

20 Phe Lys Thr Asn Arg Asp Arg Ile Glu Leu Tyr Leu Lys Gly Tyr
 Thr
 85 90 95

25 Leu Asn Arg Gly Ala Tyr Ser Phe Ser Pro Ser Ala Gly Phe Arg
 Tyr
 100 105 110

30 Glu Ser Trp Asp Val Asn Tyr Asp Asn Pro Lys Lys Gln Asp Lys
 Trp
 115 120 125

35 Lys Leu Glu Leu Arg Phe Tyr Pro Asn Met Thr Tyr Lys Leu Asn
 Asp
 130 135 140

40 Gln Leu Ser Leu Tyr Met Asn Gly Phe Val Ala Pro Val Phe Phe
 Lys
 145 150 155
 160

45 Thr Gln Gln Glu Ser Arg Lys Asp Asn Asn Tyr Val Lys Gly Lys
 Leu
 165 170 175

50

Gly Ala Lys Arg Tyr Asn Asn Asp Tyr Tyr Gln Glu Leu Gln Ile
 Leu
 180 185 190

5

Gly Val Arg Tyr Lys Phe Asn Asn Asp Asn Thr Leu Trp Ala Ser
 Val
 195 200 205

10

Tyr Asn Glu Arg Lys Tyr Asn Gln His Ser Ser Lys Tyr Asp Arg
 Trp
 210 215 220

15

Gln Leu Arg Gly Gly Tyr Asp Phe Lys Val Thr Glu Glu Phe Val
 Leu
 225 230 235
 240

20

Ser Pro Phe Ile Arg Tyr Asp Leu Ser Tyr Arg Glu Lys Asn Leu
 Glu
 245 250 255

25

Ser Thr Ser Asn Asn Gly Leu Ser Lys Asn Asn Lys Glu Ile Arg
 Thr
 260 265 270

30

Gly Ala Ser Phe Ser Tyr Lys Ile Ile Pro Ser Val Lys Leu Val
 Gly
 275 280 285

35

Glu Ile Tyr Arg Gln Thr Thr Asn Ile Glu Asn Tyr Tyr Gly Glu
 His
 290 295 300

40

Ser Glu Asp Lys Asn Arg Met Phe Tyr Lys Leu Gly Ile Asn Lys
 Thr
 305 310 315
 320

45

Phe

50

<210> 45 <211> 587 <212> PRT <213> Escherichia coli <400>
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Met Gln His Arg Gln Lys Asn Ile Leu Thr Lys Thr Ser Leu Leu
5 Ser
1 5 10 15

Arg Ala Leu Ser Val Pro Cys Cys Asp Met Phe Arg Arg Gly Ser
10 Pro
20 25 30

Trp Ile Cys Tyr Leu Ser Leu Ser Val Phe Ser Gly Cys Phe Ile
15 Pro
35 40 45

Ala Phe Ser Ser Pro Ala Ala Met Leu Ser Pro Gly Asp Arg Ser
20 Ala
50 55 60

Ile Gln Gln Gln Gln Gln Gln Leu Leu Asp Glu Asn Gln Arg Gln
25 Arg
65 70 75 80

Asp Ala Leu Glu Arg Pro Leu Thr Ile Thr Pro Ser Pro Glu Thr
30 Ser
85 90 95

Ala Gly Thr Glu Gly Pro Cys Phe Thr Val Ser Ser Ile Val Val
35 Ser
100 105 110

Gly Ala Thr Arg Leu Thr Ser Ala Glu Thr Asp Arg Leu Val Pro
40 Trp
115 120 125

Val Asn Gln Cys Leu Asn Ile Thr Gly Leu Thr Ala Val Thr Asp
45 Ala
130 135 140

Val Thr Asp Gly Tyr Ile Arg Arg Gly Tyr Ile Thr Ser Arg Ala
50 Phe

| | | |
|-----|--------------------------------------------------------------------|-------------|
| 145 | 150 | 155 |
| 160 | | |
| 5 | Leu Thr Glu Gln Asp Leu Ser Gly Gly Val Leu His Ile Thr Val Met | 165 170 175 |
| 10 | Glu Gly Arg Leu Gln Gln Ile Arg Ala Glu Gly Ala Asp Leu Pro Ala | 180 185 190 |
| 15 | Arg Thr Leu Lys Met Val Phe Pro Gly Met Glu Gly Lys Val Leu Asn | 195 200 205 |
| 20 | Leu Arg Asp Ile Glu Gln Gly Met Glu Gln Ile Asn Arg Leu Arg Thr | 210 215 220 |
| 25 | Glu Pro Val Gln Ile Glu Ile Ser Pro Gly Asp Arg Glu Gly Trp Ser | 225 230 235 |
| 30 | Val Val Thr Leu Thr Ala Leu Pro Glu Trp Pro Val Thr Gly Ser Val | 245 250 255 |
| 35 | Gly Ile Asp Asn Ser Gly Gln Lys Ser Thr Gly Thr Gly Gln Leu Asn | 260 265 270 |
| 40 | Gly Val Leu Ser Phe Asn Asn Pro Leu Gly Leu Ala Asp Asn Trp Phe | 275 280 285 |
| 45 | Val Ser Gly Gly Arg Ser Ser Asp Phe Ser Val Ser His Asp Ala Arg | 290 295 300 |
| 50 | | |

| | | |
|----|-------------------------------------------------------------|---------|
| | Asn Phe Ala Ala Gly Val Ser Leu Pro Tyr Gly Tyr Thr Leu Val | |
| | Asp | |
| | 305 | 310 315 |
| 5 | 320 | |
| | Tyr Thr Tyr Ser Trp Ser Asp Tyr Leu Ser Thr Ile Asp Asn Arg | |
| | Gly | |
| | 325 | 330 335 |
| 10 | | |
| | Trp Arg Trp Arg Ser Thr Gly Asp Leu Gln Thr His Arg Leu Gly | |
| | Leu | |
| | 340 | 345 350 |
| 15 | | |
| | Ser His Val Leu Phe Arg Asn Gly Asp Met Lys Thr Ala Leu Thr | |
| | Gly | |
| | 355 | 360 365 |
| 20 | | |
| | Gly Leu Gln His Arg Ile Ile His Asn Tyr Leu Asp Asp Val Leu | |
| | Leu | |
| | 370 | 375 380 |
| 25 | | |
| | Gln Gly Ser Ser Arg Lys Leu Thr Ser Phe Ser Val Gly Leu Asn | |
| | His | |
| | 385 | 390 395 |
| 30 | 400 | |
| | Thr His Lys Phe Leu Gly Gly Val Gly Thr Leu Asn Pro Val Phe | |
| | Thr | |
| | 405 | 410 415 |
| 35 | | |
| | Arg Gly Met Pro Trp Phe Gly Ala Glu Ser Asp His Gly Lys Arg | |
| | Gly | |
| | 420 | 425 430 |
| 40 | | |
| | Asp Leu Pro Val Asn Gln Phe Arg Lys Trp Ser Val Ser Ala Ser | |
| | Phe | |
| | 435 | 440 445 |
| 45 | | |
| | Gln Arg Pro Val Thr Asp Arg Val Trp Trp Leu Thr Ser Ala Tyr | |
| | Ala | |
| | 450 | 455 460 |
| 50 | | |

Gln Trp Ser Pro Asp Arg Leu His Gly Val Glu Gln Leu Ser Leu
 Gly
 465 470 475
 5 480

Gly Glu Ser Ser Val Arg Gly Phe Lys Asp Gln Tyr Ile Ser Gly
 Asn
 10 485 490 495

Asn Gly Gly Tyr Leu Arg Asn Glu Leu Ser Trp Ser Leu Phe Ser
 Leu
 15 500 505 510

Pro Tyr Val Gly Thr Val Arg Ala Val Ala Ala Leu Asp Gly Gly
 Trp
 20 515 520 525

Leu His Ser Asp Ser Asp Asp Pro Tyr Ser Ser Gly Thr Leu Trp
 Gly
 25 530 535 540

Ala Ala Ala Gly Leu Ser Thr Thr Ser Gly His Val Ser Gly Ser
 Phe
 30 545 550 555
 560

Thr Ala Gly Leu Pro Leu Val Tyr Pro Asp Trp Leu Ala Pro Asp
 His
 35 565 570 575

Leu Thr Val Tyr Trp Arg Val Ala Val Ala Phe
 40 580 585

<210> 46 <211> 744 <212> PRT <213> Escherichia coli <400>
 46
 45

Met Asn Lys His Thr Leu Leu Leu Thr Val Leu Phe Leu Asn Leu
 Ile
 1 5 10 15
 50

| | | |
|----|-------------------------------------------------------------|----------|
| | Cys Thr Pro Val Phe Ala Gln Asn Trp Gln Val Ala Thr Phe Gly | |
| | Gln | |
| | 20 | 25 30 |
| 5 | Ser Thr Asp Leu Asn Phe Ser Ser Leu Ile Asp Ser Ala Lys Ile | |
| | Gly | |
| | 35 | 40 45 |
| 10 | Arg Asn Asn Ala Trp Leu Ala Gly Asn Asn Asn Phe Leu Glu Ala | |
| | Gly | |
| | 50 | 55 60 |
| 15 | Lys Phe Tyr Thr Leu Pro Thr Asp Phe Phe Ile Glu Ser Arg Gly | |
| | Gly | |
| | 65 | 70 75 80 |
| 20 | Lys Ile Ala Asn Ser His Asp Gly Met Thr Val Phe Tyr Thr Ile | |
| | Val | |
| | 85 | 90 95 |
| 25 | Pro Val Thr Gln Thr Phe Arg Leu Glu Ala Asp Leu Thr Leu Glu | |
| | Gln | |
| | 100 | 105 110 |
| 30 | Ile Gly Pro Glu Val Asn Gly Lys Ser Pro Ala Gly Gln Glu Gly | |
| | Ala | |
| | 115 | 120 125 |
| 35 | Gly Leu Phe Val Arg Asp Ile Ile Gly Pro Gln Arg Gln Glu Pro | |
| | Gln | |
| | 130 | 135 140 |
| 40 | Ser Ala Gly Thr Glu Glu Tyr Pro Gln Ala Ser Asn Ile Leu Met | |
| | Asn | |
| | 145 | 150 155 |
| | 160 | |
| 45 | Ala Phe Ile Thr Gln Asn Lys Lys Asn Asp Asn Leu Val Gln Ile | |
| | Thr | |
| | 165 | 170 175 |
| 50 | | |

| | | | | |
|----|--------------------------------------------------------------------|-----|-----|-----|
| | Ser Ile Val Arg Glu Gly Val Ile Lys Thr Trp Gly Asn Glu Gly Ile | 180 | 185 | 190 |
| 5 | Thr Ile Lys Lys Gln Pro Ile Ile Glu Asn Ile Asn Phe Thr Gln Lys | 195 | 200 | 205 |
| 10 | Arg Asn Ile His Met Thr Ile Glu Arg Leu Pro Glu Lys Phe Ile Leu | 210 | 215 | 220 |
| 15 | Thr Ala Phe Asp Thr Asp Arg Lys Glu Asn Gln Ser Trp Gln Phe Ser | 225 | 230 | 235 |
| 20 | | 240 | | |
| 25 | Asp Tyr Ser Gly Phe Met Asn Gln Leu Asp Asn Asn Ser Leu Ala Ile | 245 | 250 | 255 |
| 30 | Gly Phe Phe Ala Ala Arg Asn Ala Lys Leu Arg Val Lys Asn Ala Ser | 260 | 265 | 270 |
| 35 | Phe Lys Pro Gly Lys Pro Leu Val Asp Tyr Lys Gln Leu Thr Ser Arg | 275 | 280 | 285 |
| 40 | Gln Phe Ser Arg Val Arg His Lys Ala Pro Glu Leu Phe Leu Ala Ser | 290 | 295 | 300 |
| 45 | Pro Gln Ser Val Val Arg Asn Ser Thr Thr Leu Gln Phe Leu Ala Asn | 305 | 310 | 315 |
| | | 320 | | |
| 50 | Gln Ala Gly Ile Val Ser Ile Asp Asn Asp Lys Gln Thr Lys Gln Val | 325 | 330 | 335 |

| | | | | |
|----|--------------------------------------------------------------------|-----|-----|-----|
| | Gln Ala Gly Glu Leu Val Gln Phe Pro Val Thr Leu Gln Lys Lys His | | | |
| 5 | | 340 | 345 | 350 |
| | Asn Asp Phe Thr Val Asn Phe Asn Val Asp Gly Asn Ile Ser Lys Lys | | | |
| 10 | | 355 | 360 | 365 |
| | Ala Ile Arg Ile Glu Gln Val Lys Ser Asn Leu Thr Asp Pro Tyr Glu | | | |
| 15 | | 370 | 375 | 380 |
| | Ile Tyr Val Cys Ser Asp Cys Arg Gln Gly Ala Arg Gly Ser Lys Asn | | | |
| 20 | | 385 | 390 | 395 |
| | 400 | | | |
| | Asp Pro Val Asp Leu Gln Thr Ala Val Lys Phe Val Ala Pro Gly Gly | | | |
| 25 | | 405 | 410 | 415 |
| | Asn Ile Tyr Leu Asn Asp Gly Gln Tyr His Gly Ile Thr Leu Asp Arg | | | |
| 30 | | 420 | 425 | 430 |
| | Glu Leu Ser Gly Ile Pro Gly Lys Tyr Lys Thr Ile Ser Ala Ile Asn | | | |
| 35 | | 435 | 440 | 445 |
| | Pro His Lys Ala Ile Phe Ile Asn Lys Thr Phe Asn Leu Asp Ala Ser | | | |
| 40 | | 450 | 455 | 460 |
| | Tyr Trp His Leu Lys Ser Val Val Phe Asp Gly Asn Val Asp Asn Gly | | | |
| 45 | | 465 | 470 | 475 |
| | 480 | | | |
| | Asn Asn Lys Pro Ala Tyr Leu Arg Ile Ala Gly Ser Tyr Asn Ile Ile | | | |
| 50 | | 485 | 490 | 495 |

| | | | | |
|----|----------------------------------------------------------------------------------|-----|-----|-----|
| 5 | Glu His Val Ile Ala Arg Asn Asn Asp Asp Thr Gly Ile Ser Ile Ser | 500 | 505 | 510 |
| 10 | Ala Lys Asp Lys Asn Arg Phe Phe Trp Pro Ala His Asn Leu Val Leu | 515 | 520 | 525 |
| 15 | Asn Ser Asp Ser Tyr Asn Asn Leu Asp Leu Ser Gly Ile Asn Ala Asp | 530 | 535 | 540 |
| 20 | Gly Phe Ala Ala Lys Leu Gly Val Gly Pro Gly Asn Ile Phe Arg Gly 545 560 | 550 | 555 | |
| 25 | Cys Ile Ala His Asn Asn Ala Asp Asp Gly Trp Asp Leu Phe Asn Lys | 565 | 570 | 575 |
| 30 | Ile Glu Asp Gly Pro Asn Ala Ser Val Thr Ile Glu Asn Ser Val Ala | 580 | 585 | 590 |
| 35 | Tyr Glu Asn Gly Leu Pro Tyr Asn Lys Ala Asp Ile Leu Lys Gly Ser | 595 | 600 | 605 |
| 40 | Ile Gly Asn Gly Gly Glu Gly Gln Pro Ser Lys Ser Gln Val Ile Asn | 610 | 615 | 620 |
| 45 | Ser Ile Ala Ile Asn Asn Asn Met Asp Gly Phe Thr Asp Asn Phe Asn 625 640 | 630 | 635 | |
| 50 | Thr Gly Ser Leu Ile Val Arg Asn Asn Ile Ala Met Asn Asn Ala Arg | | | |

645

650

655

5 Tyr Asn Tyr Ile Leu Arg Thr Asn Pro Tyr Lys Phe Pro Ser Ser
Ile

660

665

670

10 Leu Phe Asp Asn Asn Tyr Ser Ile Arg Asp Asp Trp Glu Asn Lys
Ile

675

680

685

15 Lys Asp Phe Leu Gly Asp Thr Val Asn Ser Val Asn Tyr Lys Leu
Leu

690

695

700

20 Val Ser His Glu Thr Gly Pro Val Gln Lys Asp Leu Phe Phe Thr
Arg
705
720

710

715

25 Asp Asp Ser Gly Asn Ile Ile Tyr Pro Asp Phe Phe Leu Asn Ile
Ile

725

730

735

30 Asn Lys Phe Asn Glx Thr Met Pro
740

35 <210> 47 <211> 136 <212> PRT <213> Escherichia coli <400>
47

Met Lys Thr Phe Ile Lys Thr Leu Leu Val Ala Val Thr Ile Leu
Phe

1

5

10

15

40

Ser Val Phe Ala Thr Ala Lys Gln Val Lys Leu Pro Asn Asn Ile
Lys

20

25

30

45

Tyr Val Asn Thr Thr Glu Ala Phe Ser Cys Thr Glu Ile Asp Gly
Met

35

40

45

50

Asn Cys Gln Thr Lys Asn Pro Phe Asn Tyr Lys Asp Asn Ser Tyr
 Val
 50 55 60

5 Phe Val Leu Glu Arg Gly Gly Ala Trp Cys Tyr Asp Tyr Thr Val
 Ser
 65 70 75 80

10 Val Leu Asn Leu Lys Thr Gly Lys Ala Gln Met Leu Glu Tyr Lys
 Asp
 85 90 95

15 Asn Gln Leu Cys Ser Gly Ser Asn Lys Pro Phe Phe Glu Ile Lys
 Asn
 100 105 110

20 Gly Val Pro Thr Val Gly Val Ile Asp Thr Ser Gly Lys Pro Val
 Val
 115 120 125

25 Val Ala Leu Asp Lys Leu Lys Thr
 130 135

30 <210> 48 <211> 225 <212> PRT <213> Escherichia coli <400>
 48

Met Gln Leu Pro Val Lys Leu Leu Met Ser Leu Ile Ser Leu Val
 Ser
 35 1 5 10 15

Val Ile Ala Arg Ala Gly Lys Tyr Lys Asn Tyr Ile Arg Asp Glu
 Ile
 40 20 25 30

Lys Tyr Trp Arg Tyr Thr Ser Tyr Lys Gly Gly Glu Phe Pro Glu
 Gly
 45 35 40 45

Phe Thr Asp Glu Lys Phe Ser Ser Ala Ile Tyr Asn Gly Arg Ile
 Phe
 50 50 55 60

| | | | | |
|----|--------------------------------------------------------------------------|-----|-----|-----|
| 5 | Thr Met Lys Arg Leu His Thr Leu Met Leu Phe Leu Ala Val Leu Phe 65 | 70 | 75 | 80 |
| 10 | Thr Gly Phe Asn Val Glu Ala Ala Ser Val Lys Gln Ala Leu Ser Cys | 85 | 90 | 95 |
| 15 | Asp Pro Asn Ala Arg Ala Glu Gln Pro Gly Ala Cys Pro Thr Thr Tyr | 100 | 105 | 110 |
| 20 | Glu Leu Tyr Glu Gly Asp Ala Ala Tyr Lys Ala Ala Leu Asp Lys Ala | 115 | 120 | 125 |
| 25 | Leu Lys Pro Val Gly Leu Ser Gly Met Phe Gly Lys Gly Gly Tyr Met | 130 | 135 | 140 |
| 30 | Asp Gly Pro Gly Gly Asn Val Thr Pro Val Thr Ile Asn Gly Thr Val | 145 | 150 | 155 |
| 35 | Trp Leu Gln Gly Asp Gly Cys Lys Ala Asn Thr Cys Gly Trp Asp Phe | 165 | 170 | 175 |
| 40 | Ile Val Thr Leu Tyr Asn Pro Lys Thr His Glu Val Val Gly Tyr Arg | 180 | 185 | 190 |
| 45 | Tyr Phe Gly Leu Asp Asp Pro Ala Tyr Leu Val Trp Phe Gly Glu Ile | 195 | 200 | 205 |
| 50 | Gly Val His Glu Phe Ala Tyr Leu Val Lys Asn Tyr Val Ala Ala Val | 210 | 215 | 220 |

Asn
225

5
<210> 49 <211> 721 <212> PRT <213> Escherichia coli. <400>
49

10 Met Lys Thr Gln Ile Thr Phe Ala Ala Leu Leu Pro Ala Leu Ala
Ser
1 5 10 15

15 Phe Ile Pro Leu His Ala His Ala Ser Ser Thr Ser Glu Asp Glu
Met
20 25 30

20 Ile Val Thr Gly Asn Thr Ala Ala Asp Thr Thr Asp Ser Ala Ala
Gly
35 40 45

25 Ala Gly Phe Lys Thr Asn Asp Ile Asp Val Gly Pro Leu Gly Thr
Lys
50 55 60

30 Ser Trp Ile Glu Thr Pro Tyr Ser Ser Thr Thr Val Thr Lys Glu
Met
65 70 75 80

35 Ile Glu Asn Gln Gln Ala Gln Ser Val Ser Glu Met Leu Lys Tyr
Ser
85 90 95

40 Pro Ser Thr Gln Met Gln Ala Arg Gly Gly Met Asp Val Gly Arg
Pro
100 105 110

45 Gln Ser Arg Gly Met Gln Gly Ser Val Val Ala Asn Ser Arg Leu
Asp
115 120 125

50 Gly Leu Asn Ile Val Ser Thr Thr Ala Phe Pro Val Glu Met Leu
Glu
130 135 140

| | | | |
|----|----------------------------------------------------------------------------------|-----|---------|
| 5 | Arg Met Asp Val Leu Asn Ser Leu Thr Gly Ala Leu Tyr Gly Pro Ala 145 160 | 150 | 155 |
| 10 | Ser Pro Ala Gly Gln Phe Asn Phe Val Ala Lys Arg Pro Thr Glu Glu | 165 | 170 175 |
| 15 | Thr Leu Arg Lys Val Thr Leu Gly Tyr Gln Ser Arg Ser Ala Phe Thr | 180 | 185 190 |
| 20 | Gly His Ala Asp Leu Gly Gly His Phe Asp Glu Asn Lys Arg Phe Gly | 195 | 200 205 |
| 25 | Tyr Arg Val Asn Leu Leu Asp Gln Glu Gly Glu Gly Asn Val Asp Asp | 210 | 215 220 |
| 30 | Ser Thr Leu Arg Arg Lys Leu Val Ser Val Ala Leu Asp Trp Asn Ile 225 240 | 230 | 235 |
| 35 | Gln Pro Gly Thr Gln Leu Gln Leu Asp Ala Ser His Tyr Glu Phe Ile | 245 | 250 255 |
| 40 | Gln Lys Gly Tyr Val Gly Ser Phe Asn Tyr Gly Pro Asn Val Lys Leu | 260 | 265 270 |
| 45 | Pro Ser Ala Pro Asn Pro Lys Asp Lys Asn Leu Ala Leu Ser Thr Ala | 275 | 280 285 |
| 50 | Gly Asn Asp Leu Thr Thr Asp Thr Ile Ser Thr Arg Leu Ile His Tyr | | |

| | 290 | | 295 | | 300 |
|----|----------------------------------------------------------------------------------|-----|-----|-----|-----|
| 5 | Phe Asn Asp Asp Trp Ser Met Asn Ala Gly Val Gly Trp Gln Gln Ala 305 320 | | 310 | | 315 |
| 10 | Asp Arg Ala Met Arg Ser Val Ser Ser Lys Ile Leu Asn Asn Gln Gly | 325 | | 330 | 335 |
| 15 | Asp Ile Ser Arg Ser Met Lys Asp Ser Thr Ala Ala Gly Arg Phe Arg | 340 | | 345 | 350 |
| 20 | Val Leu Ser Asn Thr Ala Gly Leu Asn Gly His Ile Asp Thr Gly Ser | 355 | 360 | | 365 |
| 25 | Ile Gly His Asp Leu Ser Leu Ser Thr Thr Gly Tyr Val Trp Ser Leu | 370 | 375 | | 380 |
| 30 | Tyr Ser Ala Lys Gly Thr Gly Ser Ser Tyr Ser Trp Gly Thr Thr Asn 385 400 | 390 | | 395 | |
| 35 | Met Tyr His Pro Asp Ala Ile Asp Glu Gln Gly Asp Gly Lys Ile Arg | 405 | | 410 | 415 |
| 40 | Thr Gly Gly Pro Arg Tyr Arg Ser Ser Val Asn Thr Gln Gln Ser Val | 420 | 425 | | 430 |
| 45 | Thr Leu Gly Asp Thr Val Thr Phe Thr Pro Gln Trp Ser Ala Met Phe | 435 | 440 | | 445 |
| 50 | | | | | |

Tyr Leu Ser Gln Ser Trp Leu Gln Thr Lys Asn Tyr Asp Lys His
 Gly
 450 455 460

5
 Asn Gln Thr Asn Gln Val Asp Glu Asn Gly Leu Ser Pro Asn Ala
 Ala
 465 470 475
 480

10
 Leu Met Tyr Lys Ile Thr Pro Asn Thr Met Ala Tyr Val Ser Tyr
 Ala
 485 490 495

15
 Asp Ser Leu Glu Gln Gly Gly Thr Ala Pro Thr Asp Glu Ser Val
 Lys
 500 505 510

20
 Asn Ala Gly Gln Thr Leu Asn Pro Tyr Arg Ser Lys Gln Tyr Glu
 Val
 515 520 525

25
 Gly Leu Lys Ser Asp Ile Gly Glu Met Asn Leu Gly Ala Ala Leu
 Phe
 530 535 540

30
 Arg Leu Glu Arg Pro Phe Ala Tyr Leu Asp Thr Asp Asn Val Tyr
 Lys
 545 550 555
 560

35
 Glu Gln Gly Asn Gln Val Asn Asn Gly Leu Glu Leu Thr Ala Ala
 Gly
 565 570 575

40
 Asn Val Trp Gln Gly Leu Asn Ile Tyr Ser Gly Val Thr Phe Leu
 Asp
 580 585 590

45
 Pro Lys Leu Lys Asp Thr Ala Asn Ala Ser Thr Ser Asn Lys Gln
 Val
 595 600 605

50

Val Gly Val Pro Lys Val Gln Ala Asn Leu Leu Ala Glu Tyr Ser
Leu
610 615 620
5

Pro Ser Ile Pro Glu Trp Val Tyr Ser Ala Asn Val His Tyr Thr
Gly
625 630 635
10 640

Lys Arg Ala Ala Asn Asp Thr Asn Thr Ser Tyr Ala Ser Ser Tyr
Thr
15 645 650 655

Thr Trp Asp Leu Gly Thr Arg Tyr Thr Thr Lys Val Ser Asn Val
Pro
20 660 665 670

Thr Thr Phe Arg Val Val Val Asn Asn Val Phe Asp Lys His Tyr
Trp
25 675 680 685

Ala Ser Ile Phe Pro Ser Gly Thr Asp Gly Asp Asn Gly Ser Pro
Ser
30 690 695 700

Ala Phe Ile Gly Gly Gly Arg Glu Val Arg Ala Ser Val Thr Phe
Asp
35 705 710 715
720

Phe
40

<210> 50 <211> 669 <212> PRT <213> Escherichia coli <400>
50
45

Met Lys Asn Ile Thr Leu Trp Gln Arg Leu Arg Gln Val Ser Ile
Ser
1 5 10 15
50

Thr Ser Leu Arg Cys Ala Phe Leu Met Gly Ala Leu Leu Thr Leu
 Ile
 20 25 30

5
 Val Ser Ser Val Ser Leu Tyr Ser Trp His Glu Gln Ser Ser Gln
 Ile
 35 40 45

10
 Arg Tyr Ser Leu Asp Lys Tyr Phe Pro Arg Ile His Ser Ala Phe
 Leu
 50 55 60

15
 Ile Glu Gly Asn Leu Asn Leu Val Val Asp Gln Leu Asn Glu Phe
 Leu
 65 70 75 80

20
 Gln Ala Pro Asn Thr Thr Val Arg Leu Gln Leu Arg Thr Gln Ile
 Ile
 85 90 95

25
 Gln His Leu Asp Thr Ile Glu Arg Leu Ser Arg Gly Leu Ser Ser
 Arg
 100 105 110

30
 Glu Arg Gln Gln Leu Thr Val Ile Leu Gln Asp Ser Arg Ser Leu
 Leu
 115 120 125

35
 Ser Glu Leu Asp Arg Ala Leu Tyr Asn Met Phe Leu Leu Arg Glu
 Lys
 130 135 140

40
 Val Ser Glu Leu Ser Ala Arg Ile Asp Trp Leu His Asp Asp Phe
 Thr
 145 150 155
 160

45
 Thr Glu Leu Asn Ser Leu Val Gln Asp Phe Thr Trp Gln Gln Gly
 Thr
 165 170 175

50

Leu Leu Asp Gln Ile Ala Ser Arg Gln Gly Asp Thr Ala Gln Tyr
 Leu
 180 185 190

5
 Lys Arg Ser Arg Glu Val Gln Asn Glu Gln Gln Gln Val Tyr Thr
 Leu
 195 200 205

10
 Ala Arg Ile Glu Asn Gln Ile Val Asp Asp Leu Arg Asp Arg Leu
 Asn
 210 215 220

15
 Glu Leu Lys Ser Gly Arg Asp Asp Asp Ile Gln Val Glu Thr His
 Leu
 225 230 235
 240

20
 Arg Tyr Phe Glu Asn Leu Lys Lys Thr Ala Asp Glu Asn Ile Arg
 Met
 245 250 255

25
 Leu Asp Asp Trp Pro Gly Thr Ile Thr Leu Arg Gln Thr Ile Asp
 Glu
 260 265 270

30
 Leu Leu Asp Met Gly Ile Val Lys Asn Lys Met Pro Asp Thr Met
 Arg
 275 280 285

35
 Glu Tyr Val Ala Ala Gln Lys Ala Leu Glu Asp Ala Ser Arg Thr
 Arg
 290 295 300

40
 Glu Ala Thr Gln Gly Arg Phe Arg Thr Leu Leu Glu Ala Gln Leu
 Gly
 305 310 315
 320

45
 Ser Thr His Gln Gln Met Gln Met Phe Asn Gln Arg Met Glu Gln
 Ile
 325 330 335

50

Val His Val Ser Gly Gly Leu Ile Leu Val Ala Thr Ala Leu Ala
 Leu
 340 345 350
 5

Leu Leu Ala Trp Val Phe Asn His Tyr Phe Ile Arg Ser Arg Leu
 Val
 355 360 365
 10

Lys Arg Phe Thr Leu Leu Asn Gln Ala Val Val Gln Ile Gly Leu
 Gly
 370 375 380
 15

Gly Thr Glu Thr Thr Ile Pro Val Tyr Gly Asn Asp Glu Leu Gly
 Arg
 385 390 395
 20 400

Ile Ala Gly Leu Leu Arg His Thr Leu Gly Gln Leu Asn Val Gln
 Lys
 405 410 415
 25

Gln Gln Leu Glu Gln Glu Ile Thr Asp Arg Lys Val Ile Glu Ala
 Asp
 420 425 430
 30

Leu Arg Ala Thr Gln Asp Glu Leu Ile Gln Thr Ala Lys Leu Ala
 Val
 435 440 445
 35

Val Gly Gln Thr Met Thr Thr Leu Ala His Glu Ile Asn Gln Pro
 Leu
 450 455 460
 40

Asn Ala Leu Ser Met Tyr Leu Phe Thr Ala Arg Arg Ala Ile Glu
 Gln
 465 470 475
 45 480

Thr Gln Lys Glu Gln Ala Ser Met Met Leu Gly Lys Ala Glu Gly
 Val
 485 490 495
 50

| | | | | |
|----|-----------------------------------------------------------------|-----|-----|-----|
| 5 | Ile Ser Arg Ile Asp Ala Ile Ile Arg Ser Leu Arg Gln Phe Thr Arg | 500 | 505 | 510 |
| 10 | Arg Ala Glu Leu Glu Thr Ser Leu His Ala Val Asp Leu Ala Gln Met | 515 | 520 | 525 |
| 15 | Phe Ser Ala Ala Trp Glu Leu Leu Ala Met Arg His Arg Ser Leu Gln | 530 | 535 | 540 |
| 20 | Ala Thr Leu Val Leu Pro Gln Gly Thr Ala Thr Val Ser Gly Asp Glu | 545 | 550 | 555 |
| | 560 | | | |
| 25 | Val Arg Thr Gln Gln Val Leu Val Asn Val Leu Ala Asn Ala Leu Asp | 565 | 570 | 575 |
| 30 | Val Cys Gly Gln Gly Ala Val Ile Thr Val Asn Trp Gln Met Gln Gly | 580 | 585 | 590 |
| 35 | Lys Thr Leu Asn Val Phe Ile Gly Asp Asn Gly Pro Gly Trp Pro Glu | 595 | 600 | 605 |
| 40 | Ala Leu Leu Pro Ser Leu Leu Lys Pro Phe Thr Thr Ser Lys Glu Val | 610 | 615 | 620 |
| 45 | Gly Leu Gly Ile Gly Leu Ser Ile Cys Val Ser Leu Met Glu Gln Met | 625 | 630 | 635 |
| | 640 | | | |
| 50 | Lys Gly Glu Leu Arg Leu Ala Ser Thr Met Thr Arg Asn Ala Cys Val | | | |

645

650

655

5 Val Leu Gln Phe Arg Leu Thr Asp Val Glu Asp Ala Lys
660 665

10 <210> 51 <211> 753 <212> PRT <213> Escherichia coli <400>
51

Met Asn Val Ile Lys Leu Ala Ile Gly Ser Gly Ile Leu Leu Leu
Ser
1 5 10 15

15 Cys Gly Ala Tyr Ser Gln Ser Ile Ser Glu Lys Thr Asn Ser Asp
Lys
20 25 30

20 Lys Gly Ala Ala Glu Phe Ser Pro Leu Ser Val Ser Val Gly Lys
Thr
35 40 45

25 Thr Ser Glu Gln Glu Ala Leu Glu Lys Thr Gly Ala Thr Ser Ser
Arg
50 55 60

30 Thr Thr Asp Lys Asn Leu Gln Ser Leu Asp Ala Thr Val Arg Ser
Met
65 70 75 80

35 Pro Gly Thr Tyr Thr Gln Ile Asp Pro Gly Gln Gly Ala Ile Ser
Val
85 90 95

40 Asn Ile Arg Gly Met Ser Gly Phe Gly Arg Val Asn Thr Met Val
Asp
100 105 110

45 Gly Ile Thr Gln Ser Phe Tyr Gly Thr Ser Thr Ser Gly Thr Thr
Thr
115 120 125

50

His Gly Ser Thr Asn Asn Met Ala Gly Val Leu Ile Asp Pro Asn
 Leu
 130 135 140

5

Leu Val Ala Val Asp Val Thr Arg Gly Asp Ser Ser Gly Ser Glu
 Gly
 145 150 155
 160

10

Ile Asn Ala Leu Ala Gly Ser Ala Asn Met Arg Thr Ile Gly Val
 Asp
 165 170 175

15

Asp Val Ile Phe Asn Gly Asn Thr Tyr Gly Leu Arg Ser Arg Phe
 Ser
 180 185 190

20

Val Gly Ser Asn Gly Leu Gly Arg Ser Gly Met Ile Ala Leu Gly
 Gly
 195 200 205

25

Lys Ser Asp Ala Phe Thr Asp Thr Gly Ser Ile Gly Val Met Ala
 Ala
 210 215 220

30

Val Ser Gly Ser Ser Val Tyr Ser Asn Phe Ser Asn Gly Ser Gly
 Ile
 225 230 235
 240

35

Asn Ser Lys Glu Phe Gly Tyr Asp Lys Tyr Met Lys Gln Asn Pro
 Lys
 245 250 255

40

Ser Gln Leu Tyr Lys Met Asp Ile Arg Pro Asp Glu Phe Asn Ser
 Phe
 260 265 270

45

Glu Leu Ser Ala Arg Thr Tyr Glu Asn Lys Phe Thr Arg Arg Asp
 Ile
 275 280 285

50

Thr Ser Asp Asp Tyr Tyr Ile Lys Tyr His Tyr Thr Pro Phe Ser
 Glu
 290 295 300
 5

Leu Ile Asp Phe Asn Val Thr Ala Ser Thr Ser Arg Gly Asn Gln
 Lys
 305 310 315
 10 320

Tyr Arg Asp Gly Ser Leu Tyr Thr Phe Tyr Lys Thr Ser Ala Gln
 Asn
 15 325 330 335

Arg Ser Asp Ala Leu Asp Ile Asn Asn Thr Ser Arg Phe Thr Val
 Ala
 20 340 345 350

Asp Asn Asp Leu Glu Phe Met Leu Gly Ser Lys Leu Met Arg Thr
 Arg
 25 355 360 365

Tyr Asp Arg Thr Ile His Ser Ala Ala Gly Asp Pro Lys Ala Asn
 Gln
 30 370 375 380

Glu Ser Ile Glu Asn Asn Pro Phe Ala Pro Ser Gly Gln Gln Asp
 Ile
 35 385 390 395
 400

Ser Ala Leu Tyr Thr Gly Leu Lys Val Thr Arg Gly Ile Trp Glu
 Ala
 40 405 410 415

Asp Phe Asn Leu Asn Tyr Thr Arg Asn Arg Ile Thr Gly Tyr Lys
 Pro
 45 420 425 430

Ala Cys Asp Ser Arg Val Ile Cys Val Pro Gln Gly Ser Tyr Asp
 Ile
 50 435 440 445

| | | | | | | | | | | | | | | | | |
|----|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| 5 | Asp Gln | Asp | Lys | Glu | Gly | Gly | Phe | Asn | Pro | Ser | Val | Gln | Leu | Ser | Ala | |
| | | 450 | | | | | 455 | | | | | 460 | | | | |
| 10 | Val Arg | Thr | Pro | Trp | Leu | Gln | Pro | Phe | Ile | Gly | Tyr | Ser | Lys | Ser | Met | |
| | 465 | | | | | 470 | | | | | | 475 | | | | |
| | 480 | | | | | | | | | | | | | | | |
| 15 | Ala Ser | Pro | Asn | Ile | Gln | Glu | Met | Phe | Phe | Ser | Asn | Ser | Gly | Gly | Ala | |
| | | | | | | 485 | | | | 490 | | | | | 495 | |
| 20 | Met Gly | Asn | Pro | Phe | Leu | Lys | Pro | Glu | Arg | Ala | Glu | Thr | Trp | Gln | Ala | |
| | | | | | | 500 | | | | 505 | | | | 510 | | |
| 25 | Phe Arg | Asn | Ile | Asp | Thr | Arg | Asp | Leu | Leu | Val | Glu | Gln | Asp | Ala | Leu | |
| | | | | | | 515 | | | | 520 | | | 525 | | | |
| 30 | Phe Ser | Lys | Ala | Leu | Ala | Tyr | Arg | Ser | Arg | Ile | Gln | Asn | Tyr | Ile | Tyr | |
| | | 530 | | | | | | 535 | | | | | 540 | | | |
| 35 | Glu Glu | Ser | Tyr | Leu | Val | Cys | Ser | Gly | Gly | Arg | Lys | Cys | Ser | Leu | Pro | |
| | 545 | | | | | | 550 | | | | | 555 | | | | |
| | 560 | | | | | | | | | | | | | | | |
| 40 | Val Asn | Ile | Gly | Asn | Gly | Trp | Glu | Gly | Ile | Ser | Asp | Glu | Tyr | Ser | Asp | |
| | | | | | | 565 | | | | 570 | | | | | 575 | |
| 45 | Met Phe | Tyr | Ile | Tyr | Val | Asn | Ser | Ala | Ser | Asp | Val | Ile | Ala | Lys | Gly | |
| | | | | | | 580 | | | | 585 | | | | 590 | | |
| 50 | Glu Ser | Leu | Glu | Met | Asp | Tyr | Asp | Ala | Gly | Phe | Ala | Phe | Gly | Arg | Leu | |

595

600

605

5 Phe Ser Gln Gln Gln Thr Asp Gln Pro Thr Ser Ile Ala Ser Thr
His

610

615

620

10 Phe Gly Ala Gly Asp Ile Thr Glu Leu Pro Arg Lys Tyr Met Thr
Leu
625
640

630

635

15 Asp Thr Gly Val Arg Phe Phe Asp Asn Ala Leu Thr Leu Gly Thr
Ile

645

650

655

20 Ile Lys Tyr Thr Gly Lys Ala Arg Arg Leu Ser Pro Asp Phe Glu
Gln

660

665

670

25 Asp Glu His Thr Gly Ala Ile Ile Lys Gln Asp Leu Pro Gln Ile
Pro

675

680

685

30 Thr Ile Ile Asp Leu Tyr Gly Thr Tyr Glu Tyr Asn Arg Asn Leu
Thr

690

695

700

35 Leu Lys Leu Ser Val Gln Asn Leu Met Asn Arg Asp Tyr Ser Glu
Ala

705

710

715

720

40 Leu Asn Lys Leu Asn Met Met Pro Gly Leu Gly Asp Glu Thr His
Pro

725

730

735

45 Ala Asn Ser Ala Arg Gly Arg Thr Trp Ile Phe Gly Gly Asp Ile
Arg

740

745

750

50 Phe

5 <210> 52 <211> 133 <212> PRT <213> Escherichia coli <400>
 52
 Met Ser Ser Lys Thr Lys Cys Trp Leu Trp Met Leu Leu Val Ile
 Leu
 1 5 10 15
 10
 Ser Glu Thr Ser Ala Thr Ser Thr Leu Lys Met Phe Asp Asn Ser
 Glu
 20 25 30
 15
 Gly Met Thr Lys Thr Leu Leu Leu Ala Leu Ile Val Val Leu Tyr
 Cys
 35 40 45
 20
 Ile Cys Tyr Tyr Ser Leu Ser Arg Ala Val Lys Asp Ile Pro Val
 Gly
 50 55 60
 25
 Leu Ala Tyr Ala Thr Trp Ser Gly Thr Gly Ile Leu Met Val Ser
 Thr
 65 70 75 80
 30
 Leu Gly Ile Leu Phe Tyr Gly Gln His Pro Asp Thr Ala Ala Ile
 Ile
 85 90 95
 35
 Gly Met Val Ile Ile Ala Ser Gly Ile Ile Ile Met Asn Leu Phe
 Ser
 100 105 110
 40
 Lys Met Gly Ser Glu Glu Ala Glu Glu Thr Pro Val Thr Asn Leu
 Asp
 115 120 125
 45
 Lys Lys Ile Ala Asn
 130
 50

<210> 53 <211> 286 <212> PRT <213> Escherichia coli <400>
53

| | | | | |
|----|-------------------------------------------------------------------------|-----|-----|-----|
| 5 | Met Tyr Ile Lys Lys His Trp Ile Ala Leu Ser Ile Leu Leu Ile Pro 1 | 5 | 10 | 15 |
| 10 | Cys Ile Gly Asn Ala Gln Glu Ile Lys Ile Asp Glu Ser Trp Leu His | 20 | 25 | 30 |
| 15 | Gln Ser Leu Asn Val Ile Gly Arg Thr Asp Ser Arg Phe Gly Pro Arg | 35 | 40 | 45 |
| 20 | Leu Thr Asn Asp Leu Tyr Pro Glu Tyr Thr Val Ala Gly Arg Lys Asp | 50 | 55 | 60 |
| 25 | Trp Phe Asp Phe Tyr Gly Tyr Val Asp Leu Pro Lys Phe Phe Gly Val | 65 | 70 | 75 |
| | | | | 80 |
| 30 | Gly Ser His Tyr Asp Val Gly Ile Trp Asp Glu Gly Ser Pro Leu Phe | 85 | 90 | 95 |
| 35 | Thr Glu Ile Glu Pro Arg Phe Ser Ile Asp Lys Leu Thr Gly Leu Asn | 100 | 105 | 110 |
| 40 | Leu Ala Phe Gly Pro Phe Lys Glu Trp Phe Ile Ala Asn Asn Tyr Val | 115 | 120 | 125 |
| 45 | Tyr Asp Met Gly Asp Asn Gln Ser Ser Arg Gln Ser Thr Trp Tyr Met | 130 | 135 | 140 |
| 50 | Gly Leu Gly Thr Asp Ile Asp Thr Gly Leu Pro Ile Lys Leu Ser Ala | | | |

181/370

145
160

150

155

5 Asn Ile Tyr Ala Lys Tyr Gln Trp Gln Asn Tyr Gly Ala Ala Asn
Glu
165 170 175

10 Asn Glu Trp Asp Gly Tyr Arg Phe Lys Ile Lys Tyr Ser Ile Pro
Leu
180 185 190

15 Thr Asn Leu Phe Gly Gly Arg Leu Val Tyr Asn Ser Phe Thr Asn
Phe
195 200 205

20 Asp Phe Gly Ser Asp Leu Ala Asp Lys Ser His Asn Asn Lys Arg
Thr
210 215 220

25 Ser Asn Ala Ile Ala Ser Ser His Ile Leu Ser Leu Leu Tyr Glu
His
225 230 235
240

30 Trp Lys Phe Ala Phe Thr Leu Arg Tyr Phe His Asn Gly Gly Gln
Trp
245 250 255

35 Asn Ala Gly Glu Lys Val Asn Phe Gly Asp Gly Pro Phe Glu Leu
Lys
260 265 270

40 Asn Thr Gly Trp Gly Thr Tyr Thr Thr Ile Gly Tyr Gln Phe
275 280 285

45 <210> 54 <211> 172 <212> PRT <213> Escherichia coli <400>
54

Mét Arg Ile Ala Pro Arg Thr Phe Phe Ala Ile Ser Ala Leu Ala
Phe

50 1 5 10 15

Ile Val Ala Ser Gly Phe Ser Phe Trp Arg Leu Ser Pro Ala Glu
 Asn
 20 25 30
 5

Thr Gly Ile Met Ser Cys Ser Thr Lys Gly Ile Met Arg Phe Glu
 Asn
 35 40 45
 10

Met Glu Lys Glu Asn Val Asn Gly Asn Ile His Phe Asn Phe Gly
 Ser
 50 55 60
 15

Gln Gly Lys Gly Ser Met Val Leu Glu Gly Tyr Thr Asp Ser Ala
 Ala
 65 70 75 80
 20

Gly Trp Leu Tyr Leu Gln Arg Tyr Val Lys Phe Thr Tyr Thr Ser
 Lys
 85 90 95
 25

Arg Val Ser Ala Thr Glu Arg His Tyr Arg Ile Ser Gln Trp Glu
 Ser
 100 105 110
 30

Ser Ala Ser Ser Ile Asp Glu Ser Pro Asp Val Ile Phe Asp Tyr
 Phe
 115 120 125
 35

Met Arg Glu Met Ser Asp Ser His Asp Gly Leu Phe Leu Asn Ala
 Gln
 130 135 140
 40

Lys Leu Asn Asp Lys Ala Ile Leu Leu Ser Ser Ile Asn Ser Pro
 Leu
 145 150 155
 45

Trp Ile Cys Thr Leu Lys Ser Gly Ser Lys Leu Asp
 165 170
 50

<210> 55 <211> 182 <212> PRT <213> Escherichia coli <400>
55

5 Met Lys Ile Lys Val Ile Ala Leu Ala Thr Phe Val Ser Ala Val
Phe
1 5 10 15

10 Ala Gly Ser Ala Met Ala Tyr Asp Gly Thr Ile Thr Phe Thr Gly
Lys
20 25 30

15 Val Val Ala Gln Thr Cys Thr Val Asn Thr Ser Asp Lys Asp Leu
Ala
35 40 45

20 Val Thr Leu Pro Thr Val Ala Thr Ser Ser Leu Lys Asp Asn Ala
Ala
50 55 60

25 Thr Ser Gly Leu Thr Pro Phe Ala Ile Arg Leu Thr Gly Cys Ala
Thr
65 70 75 80

30 Gly Met Asn Ser Ala Gln Asn Val Lys Ala Tyr Phe Glu Pro Ser
Ser
85 90 95

35 Asn Ile Asp Leu Ala Thr His Asn Leu Lys Asn Thr Ala Thr Pro
Thr
100 105 110

40 Lys Ala Asp Asn Val Gln Ile Gln Leu Leu Asn Ser Asn Gly Thr
Ser
115 120 125

45 Thr Ile Leu Leu Gly Glu Ala Asp Asn Gly Gln Asp Val Gln Ser
Glu
130 135 140

50 Thr Ile Gly Ser Asp Gly Ser Ala Thr Leu Arg Tyr Met Ala Gln
Tyr

| | | | |
|----|-------------------------------------------------------------|-----|-------|
| | 145 | 150 | 155 |
| | 160 | | |
| 5 | Tyr Ala Thr Gly Gln Ser Thr Ala Gly Asp Val Lys Ala Thr Val | | |
| | His | | |
| | 165 | 170 | 175 |
| 10 | Tyr Thr Ile Ala Tyr Glu | | |
| | 180 | | |
| 15 | <210> 56 <211> 359 <212> PRT <213> Escherichia coli <400> | | |
| | 56 | | |
| | Met Lys Arg Ile Phe Phe Ile Pro Leu Phe Leu Ile Leu Leu Pro | | |
| | Lys | | |
| 20 | 1 | 5 | 10 15 |
| | Leu Ala Val Ala Gly Pro Asp Asp Tyr Val Pro Ser Gln Ile Ala | | |
| | Val | | |
| 25 | 20 | 25 | 30 |
| | Asn Thr Ser Thr Leu Pro Gly Val Val Ile Gly Pro Ala Asp Ala | | |
| | His | | |
| 30 | 35 | 40 | 45 |
| | Thr Tyr Pro Arg Val Ile Gly Glu Leu Ala Gly Thr Ser Asn Gln | | |
| | Tyr | | |
| 35 | 50 | 55 | 60 |
| | Val Phe Asn Gly Gly Ala Ile Ala Leu Met Arg Gly Lys Phe Thr | | |
| | Pro | | |
| 40 | 65 | 70 | 75 80 |
| | Ala Leu Pro Lys Ile Gly Ser Ile Thr Val Tyr Phe Pro Ser Arg | | |
| | Lys | | |
| 45 | 85 | 90 | 95 |
| | Gln Arg Asp Ser Ser Asp Phe Asp Ile Tyr Asp Ile Gly Val Ser | | |
| | Gly | | |
| 50 | 100 | 105 | 110 |

Leu Gly Ile Ile Ile Gly Met Ala Gly Tyr Trp Pro Ala Thr Pro
Leu

115

120

125

5

Val Pro Ile Asn Ser Ser Gly Ile Tyr Ile Asp Pro Val Gly Ala
Asn

130

135

140

10

Thr Asn Pro Asn Thr Tyr Asn Gly Ala Thr Ala Ser Phe Gly Ala
Arg

145

150

155

160

15

Leu Phe Val Ala Phe Val Ala Thr Gly Arg Leu Pro Asn Gly Tyr
Ile

165

170

175

20

Thr Ile Pro Thr Arg Gln Leu Gly Thr Ile Leu Leu Glu Ala Lys
Arg

180

185

190

25

Thr Ser Leu Asn Asn Lys Gly Leu Thr Ala Pro Val Met Leu Asn
Gly

195

200

205

30

Gly Arg Ile Gln Val Gln Ser Gln Thr Cys Thr Met Gly Gln Lys
Asn

210

215

220

35

Tyr Val Val Pro Leu Asn Thr Val Tyr Gln Ser Gln Phe Thr Ser
Leu

225

230

235

40

Tyr Lys Glu Ile Gln Gly Gly Lys Ile Asp Ile His Leu Gln Cys
Pro

45

245

250

255

Asp Gly Ile Asp Val Tyr Ala Thr Leu Thr Asp Ala Ser Gln Pro
Val

50

260

265

270

Asn Arg Thr Asp Ile Leu Thr Leu Ser Ser Glu Ser Thr Ala Lys
 Gly
 275 280 285
 5

Phe Gly Ile Arg Leu Tyr Lys Asp Ser Asp Val Thr Ala Ile Ser
 Tyr
 290 295 300
 10

Gly Glu Asp Ser Pro Val Lys Gly Asn Gly Ser Gln Trp His Phe
 Ser
 305 310 315
 15

Asp Tyr Arg Gly Glu Val Asn Pro His Ile Asn Leu Arg Ala Asn
 Tyr
 325 330 335
 20

Ile Lys Ile Ala Asp Ala Thr Thr Pro Gly Ser Val Lys Ala Ile
 Ala
 340 345 350
 25

Thr Ile Thr Phe Ser Tyr Gln
 355
 30

<210> 57 <211> 844 <212> PRT <213> Escherichia coli <400>
 57

Met Asn Ala Asn Asn Leu Ser Cys Leu Ile Tyr Cys Arg Cys Ser
 Leu
 1 5 10 15
 35

Leu Leu Phe Ala Ala Leu Gly Leu Thr Val Thr Asn His Ser Phe
 Ala
 20 25 30
 40

Ala Glu Glu Ala Glu Phe Asp Ser Glu Phe Leu His Leu Asp Lys
 Gly
 35 40 45
 45

Ile Asn Ala Ile Asp Ile Arg Arg Phe Ser His Gly Asn Pro Val
 Pro
 50

| | | | | |
|----|----------------------------------------------------------------------------------|-----|-----|-----|
| | 50 | 55 | 60 | |
| 5 | Glu Gly Arg Tyr Tyr Ser Asp Ile Tyr Val Asn Asn Val Trp Lys Gly 65 | 70 | 75 | 80 |
| 10 | Lys Ala Asp Leu Gln Tyr Leu Arg Thr Ala Asn Thr Gly Ala Pro Thr | 85 | 90 | 95 |
| 15 | Leu Cys Leu Thr Pro Glu Leu Leu Ser Leu Ile Asp Leu Val Lys Asp | 100 | 105 | 110 |
| 20 | Thr Met Ser Gly Asn Thr Ser Cys Phe Pro Ala Ser Thr Gly Leu Ser | 115 | 120 | 125 |
| 25 | Ser Ala Arg Ile Asn Phe Asp Leu Ser Thr Leu Arg Leu Asn Ile Glu | 130 | 135 | 140 |
| 30 | Ile Pro Gln Ala Leu Leu Asn Thr Arg Pro Arg Gly Tyr Ile Ser Pro 145 160 | 150 | 155 | |
| 35 | Ala Gln Trp Gln Ser Gly Val Pro Ala Ala Phe Ile Asn Tyr Asp Ala | 165 | 170 | 175 |
| 40 | Asn Tyr Tyr Gln Tyr Ser Ser Ser Gly Thr Ser Asn Glu Gln Thr Tyr | 180 | 185 | 190 |
| 45 | Leu Gly Leu Lys Ala Gly Phe Asn Leu Trp Gly Trp Ala Leu Arg His | 195 | 200 | 205 |
| 50 | Arg Gly Ser Glu Ser Trp Asn Asn Ser Tyr Pro Ala Gly Tyr Gln Asn | | | |

| | 210 | 215 | 220 |
|----|----------------------------------------------------------------------------------|---------|---------|
| 5 | Ile Glu Thr Ser Ile Met His Asp Leu Ala Pro Leu Arg Ala Gln Phe 225 240 | 230 | 235 |
| 10 | Thr Leu Gly Asp Phe Tyr Thr Asn Gly Glu Leu Met Asp Ser Leu Ser | 245 | 250 255 |
| 15 | Leu Arg Gly Val Arg Leu Ala Ser Asp Glu Arg Met Leu Pro Gly Ser | 260 265 | 270 |
| 20 | Leu Arg Gly Tyr Ala Pro Ala Val Arg Gly Ile Ala Asn Ser Asn Ala | 275 280 | 285 |
| 25 | Lys Val Thr Ile Tyr Gln Asn Ala His Ile Leu Tyr Glu Thr Thr Val | 290 295 | 300 |
| 30 | Pro Ala Gly Pro Phe Val Ile Asn Asp Leu Tyr Pro Ser Gly Tyr Ala 305 320 | 310 | 315 |
| 35 | Gly Asp Leu Leu Val Lys Ile Thr Glu Ser Asn Gly Gln Thr Arg Met | 325 330 | 335 |
| 40 | Phe Thr Val Pro Phe Ala Ala Val Ala Gln Leu Ile Arg Pro Gly Phe | 340 345 | 350 |
| 45 | Ser Arg Trp Gln Met Ser Val Gly Lys Tyr Arg Tyr Ala Asn Lys Thr | 355 360 | 365 |
| 50 | | | |

| | | | |
|----|-------------------------------------------------------------|-----|-----|
| | Tyr Asn Asp Leu Ile Ala Gln Gly Thr Tyr Gln Tyr Gly Leu Thr | | |
| | Asn | | |
| | 370 | 375 | 380 |
| 5 | Asp Ile Thr Leu Asn Ser Gly Leu Thr Thr Ala Ser Gly Tyr Thr | | |
| | Ala | | |
| | 385 | 390 | 395 |
| | 400 | | |
| 10 | Gly Leu Ala Gly Leu Ala Phe Asn Thr Pro Leu Gly Ala Ile Ala | | |
| | Ser | | |
| | | 405 | 410 |
| 15 | | | 415 |
| | Asp Ile Thr Leu Ser Arg Thr Ala Phe Arg Tyr Ser Gly Val Thr | | |
| | Arg | | |
| | | 420 | 425 |
| 20 | | | 430 |
| | Lys Gly Tyr Ser Leu His Ser Ser Tyr Ser Ile Asn Ile Pro Ala | | |
| | Ser | | |
| | | 435 | 440 |
| 25 | | | 445 |
| | Asn Thr Asn Ile Thr Leu Ala Ala Tyr Arg Tyr Ser Ser Lys Asp | | |
| | Phe | | |
| | | 450 | 455 |
| 30 | | | 460 |
| | Tyr His Leu Lys Asp Ala Leu Ser Ala Asn His Asn Ala Phe Ile | | |
| | Asp | | |
| | 465 | 470 | 475 |
| 35 | | | |
| | 480 | | |
| | Asp Val Ser Val Lys Ser Thr Ala Phe Tyr Arg Pro Arg Asn Gln | | |
| | Phe | | |
| | | 485 | 490 |
| 40 | | | 495 |
| | Gln Ile Ser Ile Asn Gln Glu Leu Gly Glu Lys Trp Gly Gly Met | | |
| | Tyr | | |
| | | 500 | 505 |
| 45 | | | 510 |
| | Leu Thr Gly Thr Thr Tyr Asn Tyr Trp Gly His Lys Gly Ser Arg | | |
| | Asn | | |
| | | 515 | 520 |
| 50 | | | 525 |

| | | | |
|----|--------------------------------------------------------------------|-----|-----|
| | Glu Tyr Gln Ile Gly Tyr Ser Asn Phe Trp Lys Gln Leu Gly Tyr Gln | | |
| | 530 | 535 | 540 |
| 5 | | | |
| | Ile Gly Leu Ser Gln Ser Arg Asp Asn Glu Gln Gln Arg Arg Asp Asp | | |
| | 545 | 550 | 555 |
| 10 | 560 | | |
| | Arg Phe Tyr Ile Asn Phe Thr Leu Pro Leu Gly Gly Ser Val Gln Ser | | |
| 15 | 565 | 570 | 575 |
| | Pro Val Phe Ser Thr Val Leu Asn Tyr Ser Lys Glu Glu Lys Asn Ser | | |
| 20 | 580 | 585 | 590 |
| | Ile Gln Thr Ser Ile Ser Gly Thr Gly Gly Glu Asp Asn Gln Phe Ser | | |
| 25 | 595 | 600 | 605 |
| | Tyr Gly Ile Ser Gly Asn Ser Gln Glu Asn Gly Pro Ser Gly Tyr Ala | | |
| 30 | 610 | 615 | 620 |
| | Met Asn Gly Gly Tyr Arg Ser Pro Tyr Val Asn Ile Thr Thr Thr Val | | |
| 35 | 625 | 630 | 635 |
| | 640 | | |
| | Gly His Asp Thr Gln Asn Asn Asn Gln Arg Ser Phe Gly Ala Ser Gly | | |
| 40 | 645 | 650 | 655 |
| | Ala Val Val Ala His Pro Tyr Gly Val Thr Leu Ser Asn Asp Leu Ser | | |
| 45 | 660 | 665 | 670 |
| | Asp Thr Phe Ala Ile Ile His Ala Glu Gly Ala Gln Gly Ala Val Ile | | |
| 50 | 675 | 680 | 685 |

| | | | | | | | | | |
|----|---------|---------|---------|---------|---------|---------|---------|---------|--|
| 5 | Asn Val | Asn Ala | Ser Gly | Ser Arg | Leu Asp | Phe Trp | Gly Asn | Gly Val | |
| | 690 | | | 695 | | | 700 | | |
| 10 | Pro Ser | Tyr Val | Thr Pro | Tyr Glu | Lys Asn | Gln Ile | Ser Ile | Asp Pro | |
| | 705 | | | 710 | | | 715 | | |
| | 720 | | | | | | | | |
| 15 | Asn Ile | Leu Asp | Leu Asn | Val Glu | Leu Ser | Ala Thr | Glu Gln | Glu Ile | |
| | | | 725 | | | 730 | | 735 | |
| 20 | Pro Gly | Arg Ala | Asn Ser | Ala Thr | Leu Val | Lys Phe | Asp Thr | Lys Thr | |
| | | | 740 | | | 745 | | 750 | |
| 25 | Arg Pro | Ser Leu | Leu Phe | Asp Ile | Arg Met | Ser Thr | Gly Asn | Pro Pro | |
| | | 755 | | | 760 | | 765 | | |
| 30 | Met Val | Ala Ser | Glu Val | Leu Asp | Glu His | Gly Gln | Leu Ala | Gly Tyr | |
| | 770 | | | 775 | | | 780 | | |
| 35 | Ala His | Gln Ala | Gly Lys | Val Phe | Thr Arg | Gly Leu | Pro Glu | Lys Gly | |
| | 785 | | | 790 | | | 795 | | |
| | 800 | | | | | | | | |
| 40 | Leu Val | Ser Val | Val Trp | Gly Pro | Asp Asn | Lys Asp | Arg Cys | Ser Phe | |
| | | | 805 | | | 810 | | 815 | |
| 45 | Tyr Pro | His Val | Ala His | Asn Lys | Asp Asp | Met Gln | Ser Gln | Leu Val | |
| | | 820 | | | 825 | | 830 | | |
| 50 | Val | Leu Cys | Ile Gln | His Pro | Asn Gln | Glu Lys | Thr | | |
| | | 835 | | | 840 | | | | |

<210> 58 <211> 277 <212> PRT <213> Escherichia coli <400>
58

5
Met Val Lys Cys His Thr Leu Ile Asn Arg Arg Asn Lys Cys Leu
Leu
1 5 10 15

10
Ile Val Phe Ile Val Leu Ile Gly Trp Ile Ile Phe Arg Pro Lys
Ala
20 25 30

15
Tyr Thr Tyr Ser Leu Asn Asp Lys Glu Lys Glu Met Leu Ile Met
Leu
35 40 45

20
Ser Gln His Pro Glu Thr Arg Tyr Phe Gly Phe Tyr Ser Ile Glu
Leu
50 55 60

25
Pro Ala Asp Tyr Lys Pro Thr Gly Met Val Met Phe Ile Gln Gly
Ser
65 70 75 80

30
Ala Met Ile Pro Val Glu Thr Lys Leu Gln Tyr Tyr Pro Pro Phe
Leu
85 90 95

35
Gln Tyr Met Thr Arg Tyr Glu Ala Glu Leu Lys Asn Thr Ser Ala
Leu
100 105 110

40
Asp Pro Leu Asp Thr Pro Tyr Leu Lys Gln Val His Pro Leu Ser
Pro
115 120 125

45
Pro Met Asn Gly Val Ile Phe Glu Arg Met Lys Ala Lys Tyr Thr
Pro
130 135 140

50

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Asp Phe Ala Arg Val Leu Asp Ala Trp Lys Trp Glu Asn Gly Val
 Thr
 145 150 155
 160

5

Phe Ser Val Lys Ile Glu Ala Lys Asp Gly Arg Ala Thr Arg Tyr
 Asp
 165 170 175

10

Gly Ile Ser Lys Ile Ala Glu Tyr Ser Tyr Gly Tyr Asn Ile Pro
 Glu
 180 185 190

15

Lys Lys Val Gln Leu Leu Thr Ile Leu Ser Gly Leu Gln Pro Arg
 Ala
 195 200 205

20

Asp Asn Gln Pro Pro Ser Glu Asn Lys Leu Ala Ile Gln Tyr Ala
 Gln
 210 215 220

25

Val Asp Ala Ser Leu Leu Gly Glu Tyr Glu Leu Ser Val Asp Tyr
 Lys
 225 230 235
 240

30

Asn Ser Asn Asn Ile Lys Ile Ser Leu Gln Thr Asp Asn Asn Ser
 Tyr
 245 250 255

35

Ile Asp Ser Leu Leu Asp Ile Arg Tyr Pro Ser Asn Gly Asn Arg
 Ala
 260 265 270

40

Trp Tyr Asn Ser Ile
 275

45

<210> 59 <211> 366 <212> PRT <213> Escherichia coli <400>
 59

50 Met Leu Pro Glu Pro Val Tyr Arg Arg Trp Ile Ile Leu Leu Ile
 Ser

| | | | |
|-------------------------------------------------------------|-----|-----|-----|
| 1 | 5 | 10 | 15 |
| Met Leu Thr Val Gly Thr Leu Phe Ile Leu Ser Val Trp Asn Ser | | | |
| 5 Ala | 20 | 25 | 30 |
| Thr Tyr Trp Asp Ile Phe Ile Tyr Gly Val Leu Pro Met Leu Phe | | | |
| 10 Leu | 35 | 40 | 45 |
| Trp Leu Cys Leu Phe Gly Ile Ala Leu Asn Lys Tyr Glu Gln Ser | | | |
| 15 Val | 50 | 55 | 60 |
| Ala Ala Cys Ile Ser Trp Glu Ser Glu Arg Gln Gln Val Lys Gln | | | |
| 20 Leu | 65 | 70 | 75 |
| | | | 80 |
| Trp Gln His Trp Ser Gln Lys Gln Leu Ala Ile Val Gly Asn Val | | | |
| 25 Leu | 85 | 90 | 95 |
| Phe Thr Pro Glu Glu Lys Gly Met Ser Val Leu Leu Gly Pro Gln | | | |
| 30 Glu | 100 | 105 | 110 |
| Glu Ile Pro Ala Tyr Pro Lys Lys Ala Arg Pro Leu Phe Ser Ala | | | |
| 35 Ser | 115 | 120 | 125 |
| Arg Tyr Ser Leu Ser Ser Ile Phe His Asp Ile His Gln Gln Leu | | | |
| 40 Thr | 130 | 135 | 140 |
| Gln Gln Phe Pro Asp Tyr Arg His Tyr Leu His Thr Ile Tyr Val | | | |
| 45 Leu | 145 | 150 | 155 |
| 160 | | | |
| Gln Pro Glu Lys Trp Arg Gly Glu Thr Val Arg Gln Ala Ile Phe | | | |
| 50 His | | | |

| | | | | | | |
|----|----------------------------------------------------------------------------------|-----|-----|-----|-----|-----|
| | | 165 | | 170 | | 175 |
| 5 | Gln Trp Asp Leu Val Pro Glu Arg Thr Asn Thr Leu Asn Gln Ile Gln | 180 | | 185 | | 190 |
| 10 | Ser Leu Tyr Asp Glu Arg Phe Asp Gly Leu Ile Leu Val Val Cys Leu | 195 | | 200 | | 205 |
| 15 | Gln Asn Trp Pro Glu Asn Lys Pro Glu Asp Thr Ser Glu Leu Val Ser | 210 | | 215 | | 220 |
| 20 | Ala Gln Leu Ile Ser Ser Ser Ser Phe Val Arg Gln His Gln Ile Pro 225 240 | | 230 | | 235 | |
| 25 | Val Ile Ala Gly Leu Gly Arg Val Met Pro Leu Glu Pro Glu Glu Leu | 245 | | 250 | | 255 |
| 30 | Glu His Asn Leu Asp Val Leu Phe Glu Tyr Asn Gln Leu Asp Asn Lys | 260 | | 265 | | 270 |
| 35 | Gln Leu Gln His Val Trp Val Ser Gly Leu Asp Glu Gly Thr Ile Glu | 275 | | 280 | | 285 |
| 40 | Asn Leu Met Gln Tyr Ala Glu Gln His Gln Trp Ser Leu Pro Lys Lys | 290 | | 295 | | 300 |
| 45 | Arg Pro Leu His Met Ile Asp His Ser Phe Gly Pro Thr Gly Glu Phe 305 320 | | 310 | | 315 | |
| 50 | | | | | | |

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Ile Phe Pro Val Ser Leu Ala Met Leu Ser Glu Ala Ala Lys Glu
 Thr
 325 330 335

5
 Glu Gln Asn His Leu Ile Ile Tyr Gln Ser Ala Gln Tyr Ala Gln
 Lys
 340 345 350

10
 Lys Ser Leu Cys Leu Ile Thr Arg Lys Leu Tyr Leu Arg Thr
 355 360 365

15 <210> 60 <211> 260 <212> PRT <213> Escherichia coli <400>
 60

Met Leu Asn Arg Lys Leu Asn Ile Arg Leu Arg His Ser Leu Asn
 Ser
 20 1. 5 10 15

His Cys Ile Pro Ser Ile Ile Ile Asn Asn Thr Val Arg Ser Phe
 Gln
 25 20 25 30

Arg Ser Val Met Asn Thr Arg Ala Leu Phe Pro Leu Leu Phe Thr
 Val
 30 35 40 45

Ala Ser Phe Ser Ala Ser Ala Gly Asn Trp Ala Val Lys Asn Gly
 Trp
 35 50 55 60

Cys Gln Thr Met Thr Glu Asp Gly Gln Ala Leu Val Met Leu Lys
 Asn
 40 65 70 75 80

Gly Thr Ile Gly Ile Thr Gly Leu Met Gln Gly Cys Pro Asn Gly
 Val
 45 85 90 95

Gln Thr Leu Leu Gly Ser Arg Ile Ser Ile Asn Gly Asn Leu Ile
 Pro
 50 100 105 110

Thr Ser Gln Met Cys Asn Gln Gln Thr Gly Phe Arg Ala Val Glu
 Val
 115 120 125
 5

Glu Ile Gly Gln Ala Pro Glu Met Val Lys Lys Ala Val His Ser
 Ile
 130 135 140
 10

Ala Glu Arg Asp Val Ser Val Leu Gln Ala Phe Gly Val Arg Met
 Glu
 145 150 155
 15 160

Phe Thr Arg Gly Asp Met Leu Lys Val Cys Pro Lys Phe Val Thr
 Ser
 165 170 175
 20

Leu Ala Gly Phe Ser Pro Lys Gln Thr Thr Thr Ile Asn Lys Asp
 Ser
 180 185 190
 25

Val Leu Gln Ala Ala Arg Gln Ala Tyr Ala Arg Glu Tyr Asp Glu
 Glu
 195 200 205
 30

Thr Thr Glu Thr Ala Asp Phe Gly Ser Tyr Glu Val Lys Gly Asn
 Lys
 210 215 220
 35

Val Glu Phe Glu Val Phe Asn Pro Glu Asp Arg Ala Tyr Asp Lys
 Val
 225 230 235
 240
 40

Thr Val Thr Val Gly Ala Asp Gly Asn Ala Thr Gly Ala Ser Val
 Glu
 245 250 255
 45

Phe Ile Gly Lys
 260
 50

<210> 61 <211> 385 <212> PRT <213> Escherichia coli <400>
 61

5 Val Val Ile Ile Asn Ser Thr Ile Leu Ser Gly Ala Gly Ala Ile
 Pro
 1 5 10 15

10 Ser Leu Thr Ser Leu Leu Pro Asp Ile Arg Lys Met Leu Leu Val
 Thr
 20 25 30

15 Asp Arg Asn Ile Ala Gln Leu Asp Gly Val Gln Gln Ile Arg Ala
 Leu
 35 40 45

20 Leu Glu Lys His Cys Pro Gln Val Asn Val Ile Asp Asn Val Pro
 Ala
 50 55 60

25 Glu Pro Thr His His Asp Val Arg Gln Leu Met Asp Ala Pro Gly
 Asp
 65 70 75 80

30 Ala Ser Phe Asp Val Val Val Gly Ile Gly Gly Gly Ser Val Leu
 Asp
 85 90 95

35 Val Ala Lys Leu Leu Ser Val Leu Cys His Pro Gln Ser Pro Gly
 Leu
 100 105 110

40 Asp Ala Leu Leu Ala Gly Glu Lys Pro Thr Gln Arg Val Gln Ser
 Trp
 115 120 125

45 Leu Ile Pro Thr Thr Ala Gly Thr Gly Ser Glu Ala Thr Pro Asn
 Ala
 130 135 140

50 Ile Leu Ala Ile Pro Glu Gln Ser Thr Lys Val Gly Ile Ile Ser
 Gln

| | | | | |
|-----|-----------------------------------------------------------------|-----|-----|-----|
| 145 | | 150 | | 155 |
| 160 | | | | |
| 5 | Val Leu Leu Pro Asp Tyr Val Ala Leu Phe Pro Glu Leu Thr Thr Ser | 165 | 170 | 175 |
| 10 | Met Pro Ala His Ile Ala Ala Ser Thr Gly Ile Asp Ala Leu Cys His | 180 | 185 | 190 |
| 15 | Leu Leu Glu Cys Phe Thr Ala Thr Val Ala Asn Pro Val Ser Asp Asn | 195 | 200 | 205 |
| 20 | Ala Ala Leu Thr Gly Leu Ser Lys Leu Phe Arg His Ile Gln Pro Ala | 210 | 215 | 220 |
| 25 | Val Asn Asp Pro Gln Asp Leu Arg Ala Lys Leu Glu Met Leu Trp Ala | 225 | 230 | 235 |
| | 240 | | | |
| 30 | Ser Tyr Tyr Gly Gly Val Ala Ile Thr His Ala Gly Thr His Leu Val | 245 | 250 | 255 |
| 35 | His Ala Leu Ser Tyr Pro Leu Gly Gly Lys Tyr His Leu Pro His Gly | 260 | 265 | 270 |
| 40 | Val Ala Asn Ala Ile Leu Leu Ala Pro Cys Met Ala Phe Val Arg Pro | 275 | 280 | 285 |
| 45 | Trp Ala Val Glu Lys Phe Ala Arg Val Trp Asp Cys Ile Pro Asp Ala | 290 | 295 | 300 |
| 50 | | | | |

Glu Thr Ala Leu Ser Ala Glu Glu Lys Ser His Ala Leu Val Thr
 Trp
 305 310 315
 320

5

Leu Gln Ala Leu Val Asn Gln Leu Lys Leu Pro Asn Asn Leu Ala
 Ala
 325 330 335

10

Leu Gly Val Pro Pro Glu Asp Ile Ala Ser Leu Ser Glu Ala Ala
 Leu
 340 345 350

15

Asn Val Lys Arg Leu Met Asn Asn Val Pro Cys Gln Ile Asp Leu
 Gln
 355 360 365

20

Asp Val Gln Ala Ile Tyr Gln Thr Leu Phe Pro Gln His Pro Phe
 Lys
 370 375 380

25

Glu
 385

30

<210> 62 <211> 105 <212> PRT <213> Escherichia coli <400>
 62

Met Asn Ile Arg Lys Leu Phe Cys Pro Gly Asn Thr Pro Arg Ile
 Leu
 1 5 10 15

35

Leu Phe Leu Phe Phe Phe Val Val Ser Ala Ile Thr Thr Ile Ala
 Cys
 20 25 30

40

Gly Tyr Thr Glu Lys Asn Ala Thr Gly Asn Val Leu Leu Leu Phe
 Leu
 35 40 45

45

Leu Leu Leu Leu Ala His Arg Asn Thr Leu Thr Ser Ile Thr Ala
 Leu
 50 55 60

50

Leu Phe Leu Phe Cys Cys Ala Leu Tyr Ala Pro Ala Gly Met Thr
 Tyr
 5 65 70 75 80

Gly Lys Ile Asn Asn Ser Phe Ile Val Ala Leu Leu Gln Thr Thr
 Thr
 10 85 90 95

Asp Glu Ala Ala Glu Phe Thr Gly Met
 100 105
 15

<210> 63 <211> 147 <212> PRT <213> Escherichia coli <400>
 63

20 Met Asn Ile Gln Ala Ile Lys Glu Met Val Asn Leu Ile Cys Ser
 Phe
 1 5 10 15

25 Leu Phe Ile Phe Phe Leu Ser Ser Ala Phe Val Ser Phe Gly Cys
 Tyr
 20 25 30

30 Ala Ile Tyr Glu Leu Phe Leu Trp Asn Asp Ile Ile Val Tyr Ser
 Trp
 35 40 45

35 Gly Tyr Ile Leu Ile Val Phe Leu Pro Phe Thr Leu Tyr Val Met
 Ser
 50 55 60

40 Phe Glu Ile Leu Phe Phe Ala Ile Ser Gly Arg Arg Leu Ser Lys
 Val
 65 70 75 80

45 Thr Met Val Arg Leu Trp Leu Ile Ile Lys Ile Ile Ile Ala Phe
 Ser
 85 90 95

50 Ile Cys Ala Val Leu Ile Phe Ser Ser Ile Tyr Lys Lys Glu Leu
 Leu

| | | | |
|----|--------------------------------------------------------------------|-----|----------|
| | 100 | 105 | 110 |
| 5 | Ser Arg Asn Tyr Ile Ala Cys Ser Gly Ile Pro Ser Gly Trp Met Pro | 115 | 120 125 |
| 10 | Gly Leu Ala Thr Lys Tyr Val Lys Glu Lys Ser Leu Cys Glu Lys Asn | 130 | 135 140 |
| 15 | Gly Asn Asn | 145 | |
| 20 | <210> 64 <211> 178 <212> PRT <213> Escherichia coli <400> 64 | | |
| | Met Phe Pro Ile Arg Phe Lys Arg Pro Ala Leu Leu Cys Met Ala Met | 1 | 5 10 15 |
| 25 | Leu Thr Val Val Leu Ser Gly Cys Gly Leu Ile Gln Lys Val Val Asp | 20 | 25 30 |
| 30 | Glu Ser Lys Ser Val Ala Ser Ala Val Phe Tyr Lys Gln Ile Lys Ile | 35 | 40 45 |
| 35 | Leu His Leu Asp Phe Phe Ser Arg Ser Ala Leu Asn Thr Asp Ala Glu | 50 | 55 60 |
| 40 | Asp Thr Pro Leu Ser Thr Met Val His Val Trp Gln Leu Lys Thr Arg | 65 | 70 75 80 |
| 45 | Glu Asp Phe Asp Lys Ala Asp Tyr Asp Thr Leu Phe Met Gln Glu Glu | 85 | 90 95 |
| 50 | | | |

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Lys Thr Leu Glu Lys Asp Val Leu Ala Lys His Thr Val Trp Val
 Lys
 100 105 110

5 Pro Glu Gly Thr Ala Ser Leu Asn Val Pro Leu Asp Lys Glu Thr
 Gln
 115 120 125

10 Phe Val Ala Ile Ile Gly Gln Phe Tyr His Pro Asp Glu Lys Ser
 Asp
 130 135 140

15 Ser Trp Arg Leu Val Ile Lys Arg Asp Glu Leu Glu Ala Asp Lys
 Pro
 145 150 155
 160

20 Arg Ser Ile Glu Leu Met Arg Ser Asp Leu Arg Leu Leu Pro Leu
 Lys
 165 170 175

25 Asp Lys

30 <210> 65 <211> 209 <212> PRT <213> Escherichia coli <400>
 65

35 Met Phe Leu Lys Arg Lys Trp Tyr Tyr Ala Val Thr Thr Ser Val
 Val
 1 5 10 15

40 Ile Thr Leu Cys Gly Gly Gly Tyr Tyr Met Tyr Arg Gln Glu Tyr
 Gln
 20 25 30

45 Met Val Val Thr Val Pro Thr Ala Asp Ala Asn Asp Pro Asn Trp
 Pro
 35 40 45

50 Asn Lys Arg Ile Gln Phe Asp Thr Ser Glu Trp Leu Gln Gln Leu
 Gln
 50 55 60

<210> 66 <211> 424 <212> PRT <213> Escherichia coli <400>
66

| | | | | |
|----|-------------------------------------------------------------|-----|-----|-----|
| 5 | Met Asp Ile Trp Arg Gly His Ser Phe Leu Met Thr Ile Ser Ala | | | |
| | Arg | | | |
| | 1 | 5 | 10 | 15 |
| 10 | Phe Arg Gln Tyr Val Phe Ser Leu Met Ser Ile Leu Leu Gln Glu | | | |
| | Arg | | | |
| | | 20 | 25 | 30 |
| 15 | Lys Met Asn Ile Phe Thr Leu Ser Lys Ala Pro Leu Tyr Leu Leu | | | |
| | Ile | | | |
| | | 35 | 40 | 45 |
| 20 | Ser Leu Phe Leu Pro Thr Met Ala Met Ala Ile Asp Pro Pro Glu | | | |
| | Arg | | | |
| | | 50 | 55 | 60 |
| 25 | Glu Leu Ser Arg Phe Ala Leu Lys Thr Asn Tyr Leu Gln Ser Pro | | | |
| | Asp | | | |
| | | 65 | 70 | 75 |
| | | | | 80 |
| 30 | Glu Gly Val Tyr Glu Leu Ala Phe Asp Asn Ala Ser Lys Lys Val | | | |
| | Phe | | | |
| | | 85 | 90 | 95 |
| 35 | Ala Ala Val Thr Asp Arg Val Asn Arg Glu Ala Asn Lys Gly Tyr | | | |
| | Leu | | | |
| | | 100 | 105 | 110 |
| 40 | Tyr Ser Phe Asn Ser Asp Ser Leu Lys Val Glu Asn Lys Tyr Thr | | | |
| | Met | | | |
| | | 115 | 120 | 125 |
| 45 | Pro Tyr Arg Ala Phe Ser Leu Ala Ile Asn Gln Asp Lys His Gln | | | |
| | Leu | | | |
| | | 130 | 135 | 140 |
| 50 | Tyr Ile Gly His Thr Gln Ser Ala Ser Leu Arg Ile Ser Met Phe | | | |
| | Asp | | | |

| | | | | |
|-----|----------------------------------------------------------------------------------|-----|-----|-----|
| 145 | | 150 | | 155 |
| 160 | | | | |
| 5 | Thr Pro Thr Gly Lys Leu Val Arg Thr Ser Asp Arg Leu Ser Phe Lys | 165 | 170 | 175 |
| 10 | Ala Ala Asn Ala Ala Asp Ser Arg Phe Glu His Phe Arg His Met Val | 180 | 185 | 190 |
| 15 | Tyr Ser Gln Asp Ser Asp Thr Leu Phe Val Ser Tyr Ser Asn Met Leu | 195 | 200 | 205 |
| 20 | Lys Thr Ala Glu Gly Met Lys Pro Leu His Lys Leu Leu Met Leu Asp | 210 | 215 | 220 |
| 25 | Gly Thr Thr Leu Ala Leu Lys Gly Glu Val Lys Asp Ala Tyr Lys Gly 225 240 | 230 | 235 | |
| 30 | Thr Ala Tyr Gly Leu Thr Met Asp Glu Lys Thr Gln Lys Ile Tyr Val | 245 | 250 | 255 |
| 35 | Gly Gly Arg Asp Tyr Ile Asn Glu Ile Asp Ala Lys Asn Gln Thr Leu | 260 | 265 | 270 |
| 40 | Leu Arg Thr Ile Pro Leu Lys Asp Pro Arg Pro Gln Ile Thr Ser Val | 275 | 280 | 285 |
| 45 | Gln Asn Leu Ala Val Asp Ser Ala Ser Asp Arg Ala Phe Val Val Val | 290 | 295 | 300 |
| 50 | | | | |

Phe Asp His Asp Asp Arg Ser Gly Thr Lys Asp Gly Leu Tyr Ile
 Phe
 305 310 315
 320

5

Asp Leu Arg Asp Gly Lys Gln Leu Gly Tyr Val His Thr Gly Ala
 Gly
 325 330 335

10

Ala Asn Ala Val Lys Tyr Asn Pro Lys Tyr Asn Glu Leu Tyr Val
 Thr
 340 345 350

15

Asn Phe Thr Ser Gly Thr Ile Ser Val Val Asp Ala Thr Lys Tyr
 Ser
 355 360 365

20

Ile Thr Arg Glu Phe Asn Met Pro Val Tyr Pro Asn Gln Met Val
 Leu
 370 375 380

25

Ser Asp Asp Met Asp Thr Leu Tyr Ile Gly Ile Lys Glu Gly Phe
 Asn
 385 390 395
 400

30

Arg Asp Trp Asp Pro Asp Val Phe Val Glu Gly Ala Lys Glu Arg
 Ile
 405 410 415

35

Leu Ser Ile Asp Leu Lys Lys Ser
 420

40

<210> 67 <211> 489 <212> DNA <213> Escherichia coli <400>
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 45 attttcagca 60
 caggcagtgg atacgacgat tactgtgacg ggtaatgttt tgcaaagaac
 atgtaatgta 120
 50 ccagggaatg tggatgtttc tttgggtaat ctgtatgtat cagactttcc
 caatgcagga 180

agtggaatctc catgggttaa ttttgatctg tctctcaccg gatgccagaa
tatgaataact 240

5 gttcgggcaa catttagtgg tactgcggat gggcagacat actatgcgaa
tacagggaat 300

gctggcggta tcaagattga aattcaggac agggatggaa gtaatgcac
atatcacaat 360

10 ggtatgttca agacgcttaa tgtacaaaat aataatgcaa cctttaatct
taaagcccgt 420

gcagtgaagta aaggccaggt tactcctgga aatatcagtt ctgttataac
15 cgtcacctat 480

acctatgcg
489

20 <210> 68 <211> 2019 <212> DNA <213> Escherichia coli
<400> 68
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cgccattgct 60

25 aatgcccaga cttcacagca agacgaaagc acgctgggtg ttaccgccag
taaacaatct 120

tcccgtcgg catcagccaa caacgtctcg tctactgttg tcagcgcgcc
30 ggaattaagc 180

gacgcggcg tcaccgccag cgacaaactc cccagagtct tgcccgggct
caatattgaa 240

35 aatagcggca acatgctttt ttcgacgac tcgctacgcg gcgtctcttc
agcgacaggac 300

ttctataacc ccgccgtcac cctgtatgtc gatggcgtcc ctcagctttc
40 caccaacacc 360

atccaggcgc ttaccgatgt gcaaagcgtg gagttgctgc gaggcccaca
gggaacgtta 420

tatggcaaaa gcgctcaggg cgggatcatc aacatcgtca cccagcagcc
45 ggacagcagc 480

ccgcggcggt atattgaagg cggcgtcagt agccgcgaca gttatcgaag
taagttcaac 540

50 ctgagcggcc ccattcagga tggcctgctg tacggcagcg tcaccctggt
acgccagggt 600

gatgacggcg acatgattaa ccccgcgacg ggaagcgatg acttagggcg
caccgcgcc 660

5 agcatagggga atgtgaaact gcgtctggcg ccggacgac agccctggga
aatgggcttt 720

gccgcctcac gcgaatgtac ccgcgccacc caggacgcct atgtgggatg
gaatgatatt 780

10 aagggccgta agctgtcgat cagcgatggg tcaccagacc cgtacatgcg
gcgctgcact 840

gacagccaga ccctgagtgg gaaatacacc accgatgact gggttttcaa
15 cctgatcagc 900

gcctggcagc agcagcatta ttcgcgcacc ttcccttcgg gttcgtaaat
cgtcaatatg 960

20 tctcagcgct ggaatcagga tgtgcaggag ctgcgcgctg caaccctggg
cgatgcgcgt 1020

accgttgata tgggtgtttgg gctgtaccgg cagaacaccc gcgagaagtt
aaattcagcc 1080

25 taagacatgc cgacaatgcc ttatttaagc agtaccggct ataccaccgc
tgaaacgctg 1140

gccgcataca gtgacctgac ctggcattta accgatcggt ttgatatcgg
30 cggcggcgctg 1200

cgcttctcgc atgataaatc cagtacacaa tatcacggca gcatgctcgg
caaccgttt 1260

35 ggcgaccagg gtaagagcaa tgacgatcag gtgctcgggc agctatccgc
aggctatatg 1320

ctgaccgatg actggagagt gtatacccggt gtagcccagg gatataaacc
ttccgggtac 1380

40 aacatcgtgc ctactgcggg tcttgatgcc aaaccgttcg tcgccgagaa
atccatcaac 1440

tatgaacttg gcacccgcta cgaaaccgct gacgtcacgc tgcaagccgc
45 gacgttttat 1500

accacacca aagacatgca gctttactct ggcccggtcg ggatgcagac
attaagcaat 1560

50 gcgggtaaag ccgacgccac cggcgttgag cttgaagcga agtggcggtt
tgccgccaggc 1620

tggatcatggg atatcaatgg caacgtgatc cgttccgaat tcaccaatga
cagtgaagttg 1680

5 tatcacggta accgggtgcc gttcgtacca cgttatggcg cgggaagcag
cgtgaacggc 1740

gtgattgata cgcgctatgg cgcactgatg ccccgactgg cggttaatct
ggtcggggccg 1800

10 cattatttctg atggcgacaa ccagttgcgg caaggcacct atgccaccct
ggacagcagc 1860

ctgggctggc aggcgactga acggatgaac atttccgtct atgtcgataa
15 cctgttcgac 1920

cgtcgttacc gtacctatgg ctacatgaac ggcagcagcg ccgtcgcgca
ggccaatattg 1980

20 ggtcgcaccg tcggtatcaa tacgcgaatt gatttcttc
2019

<210> 69 <211> 738 <212> DNA <213> Escherichia coli <400>
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25 atgaataagg tttttgttgt ttcagtgggtg gccgcagcct gtgtatttgc
agtaaatgca 60

ggagcaaagg aaggtaaaag cggttttttat ctgaccggta aagccgggtgc
30 ctctgtgatg 120

tcacttttcag accagcgttt cctgtcagga gatgaggaag aaacatcaaa
gtataaaggc 180

35 ggcgatgacc atgatacggc attcagtggc ggtattgcgg tcggttatga
tttttatccg 240

cagttcagta ttccggttcg tacagaactg gagttttacg ctcgtggaaa
40 agctgattcg 300

aagtataacg tagataaaga cagctgggtca ggtgggttact ggcgtgatga
cctgaagaat 360

gagggtgtcag tcaacacact aatgctgaat gcgtactatg acttccggaa
45 tgacagcgca 420

ttcacaccat gggatatccg agggattggc tacgccagaa ttcaccagaa
aacaaccggc 480

50 atcagtacct gggattatga gtacggaagc agtggtcgcg aatcgttgtc
acgttcaggc 540

tctgctgaca acttcgcatg gagccttggc gcgggtgtcc gctatgacgt
aaccgccgat 600

5 atcgctctgg acctcagcta tcgctatctt gatgcagggtg acagcagtgt
gagttacaag 660

gacgagtggg gcgataaata taagtcagaa gttgatgtta aaagtcatga
catcatgctt 720

10 ggtatgactt ataacttc
738

15 <210> 70 <211> 498 <212> DNA <213> Escherichia coli <400>
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atgaaactga aagctattat attggccacc ggtcttatta actgtattgc
attttcagca 60

20 caggcagtggtg atacgacgat tactgttaca gggagggtat tgccacgtac
ctgtaccatt 120

ggtaatggag gaaacccaaa cgccaccgtt gttttggata acgcttacac
ttctgacctg 180

25 atagcagcca acagcacctc tcagtggaaa aatttttcgt tgacattgac
gaattgtcag 240

aatgtaaaca atgttacttc atttggtgga accgcagaaa atacaaatta
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20 gcacgaccgt tattctctgc atcccgttat tctctttcgt ctatattcca
 tgatattcac 420

cagcaactga cacaacaatt tcctgattat cgtcattatc tacatactat
 ctacgtatta 480

25 cagcctgaga aatggcgtgg agaaa cgtg agacaggcta ttttccatca
 atgggaactta 540

gtacctgaac ggaccaatac tottaatcaa atccagtctc tttatgatga
 aagatttgac 600

30 ggtctaattc tggttgtttg tttaaaaaac tggccggaga ataaacctga
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35 gaactgggat cagcacagct tatctcctca tcgtcatttg tacggcagca
 ccagataccc 720

gttattgctg gtctggggcg tgtaatgcc a ttagaacctg aggagttgga
 gcataatctg 780

40 gatgtgttat ttgaatataa ccaattggat aacaaacaac tacagcatgt
 ctgggtctct 840

ggtttagatg agggaacgat agaaaacctt atgcagtatg ctgaacaaca
 tcaatgggtca 900

45 ctctcctaaaa aacggcccct acacatgatt gatcattcct ttggccctac
 aggagagttt 960

50 atttttcctg tctctctggc aatgctgtca gaggctgcc a agaaactga
 acaaaatcat 1020

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5 aagctttatt taaggaca
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taccagagct 120

ctttttcccc tgctgttcac tgtggcatca ttctccgct ccgccggcaa
ctgggctgtc 180

20 aaaaacggct ggtgtcagac catgacggaa gatggtcagg cgctggtaat
gctgaaaaat 240

ggcacgattg gtattaccgg cctgatgcag ggatgcccgga atggtgtaca
gacgctcctg 300

25 ggcagccgta tcagtattaa cggtaacctg atccccacat cacaaatgtg
taatcagcag 360

30 acgggattca gggctgttga ggtggaaatc ggacaggcgc cggaaatggt
caaaaaagcc 420

gttcactcca tagcagagcg tgatgtgtcc gttttacagg catttgggtg
acgaatggaa 480

35 ttcaccgcgc gtgatatgct gaaggctctg ccgaaatttg tcacatcact
tgccggtttt 540

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ccggcaggca 600

40 tacgccggg aatatgacga ggaaacaaca gaaacccgtg attttggctc
ttacgaagta 660

45 aaaggcaata aggttgagtt tgaagtattc aatccctgaag accgtgcgta
cgacaaagtg 720

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gcagctcgac 120

gggtgtgcagc agattcgcg cttactggaa aagcactgcc cgcagggttaa
cgttatcgat 180

10 aatgtgcccg cagagcccac gcatcatgat gtgcgcagc taatggatgc
ccctggcgat 240

gcctcttttg atgtgggtggc cgggatcggc ggtggcagcg tggtggatgt
ggcgaagctg 300

15 ctatcgggtgc tttgccatcc acaatcacgg gggctggatg cgctgcttgc
gggtgaaaaa 360

ccgactcagc gggtgcaatc atggttgatt cctacaaccg ccggaaccgg
20 ctcagaagcc 420

acgccgaatg cgattctggc aatccctgag caaagcacga aggtgggtat
tatttcccag 480

25 gtgctgttac cagactatgt ggcgcttttc ccggaactga ccaccagcat
gcccgcgcat 540

attgcggcgt ccacgggcat tgatgctctt tgccacttac tggagtgttt
taccgcgacc 600

30 gtggcaaatc cggtcagcga taacgcggcg ctgactgggt taagtaaact
tttccggcac 660

attcaaccgg ccgtgaacga tccctcaggat ctgcgcgcaa aactggaaat
35 gctgtgggcg 720

tcttactatg gcggcgtagc gataacccat gcgggcacgc atctcgttca
tgcgctctcc 780

40 tacccgttag gtggcaaata tcactctgcc catggcgctc cgaatgccat
cttgctggcg 840

ccgtgcatgg cgtttgcttcg cccctggggcg gtcgagaaat ttgcccgggt
ctgggattgc 900

45 attcccgatg cggaaccgc cctgagcgcg gaagaaaat ctcatgccct
ggtagcctgg 960

ttacaggcat tagtcaatca actcaagcta cccaacaatc tcgcgggtct
50 cggcgtagcg 1020

ccagaggata ttgcctctct gagcgaggcg gcaactgaacg tgaagcgcct
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 gaatgcaaca 120
 ggaaatgtgc tgcttctggt tctccttctg ctccctgcac acagaa atac
 20 cctcacatcc 180
 attacagcgc tgttatttct gttctgttgt gcaactgtatg cgctg ccgg
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 25 ggtaaaatca acaacagttt tattgtcgcg ttgttgcaga ccacaa ctga
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 gtttttatgg 120
 40 aatgatatta ttgtatatag ctggggatat atattaattg tctttt tacc
 tttcacatta 180
 tatgtaatgt cgtttgagat tttgtttttt gctattagtg ggcgac gatt
 gtctaaagta 240
 45 acaatgggtgc gccttttggtt gataattaa attattattg ctttct ctat
 ttgcgcagt 300
 ttgatttttt cttcaattta caaaaaagaa ttattatcta gaaatt atat
 50 tgcttgtagt 360

ggtatcccggt ctgggtggat gccgggtctg gcaacgaaat acgttaaaga
aaaatcatta 420

5 tgcgaaaaaa atggcaataa t
441

<210> 130 <211> 534 <212> DNA <213> Escherichia coli
<400> 130

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ggcctcagcc 120

15 gttttctaca aacaaatcaa aatactgcat ctcgatttct tctcccgcag
cgccctgaat 180

20 acggatgcgg aagatacgcc gctttccacg atggtgcatg tctggcaact
gaaaaccgc 240

gaagattttg acaaggcgga ttacgacacc ctgtttatgc aggaagagaa
gacgctggag 300

25 aaggacgtac tggcaaaaca caccgtctgg gtaaaaccgg aaggcacggc
atccctgaat 360

gtgccgctgg ataaagagac gcagtttgtc gccattattg ggcagtttta
tcaccctgat 420

30 gaaaaaagcg acagctggcg tctggtgatc aaaagggacg aactggaggc
cgacaagccg 480

35 cgctcgattg aactgatgag aagcgacctg cgactgctgc ctctcaagga taaa
534

<210> 131 <211> 627 <212> DNA <213> Escherichia coli
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accaactgct 120

45 gacgcgaacg atcccaactg gccaaataaa aggatacagt ttgataccag
cgaatggcta 180

50 cagcaacttc aatatattaa aatagatgat cattatatat tgaatactca
atatactcca 240

attgctaatt tggatgactt tggattaca ttaaaattac agaacgcatt
aaatgggtcg 300

5 gataaaagac ttcctgcact atatggcctt gctgagatgg atgctcagaa
atttaaagac 360

ctgatgcgcg gtaaaattaa atgtgaatat ctgaggacga catttgatgc
ggaaacatta 420

10 aagcctgtca atgattatct ccttatttct tttacttata aagataagtg
gtatgaattt 480

gagacagaaa gaaaaatatc taaaacaagt gatgatgggt attttttgtg
ggcatttgat 540

15 aatactgtcc acgaagcagg ctattggcat aacacagatc cggctgcgta
ttcctataga 600

gattaccaga atggttaaggc tgtgaaa
20 627

<210> 132 <211> 1272 <212> DNA <213> Escherichia coli
<400> 132

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cagacaatac 60

gttttctctc ttatgtcaat tttattgcag gaacgaaaaa tgaatatattt
cactttatcc 120

30 aaagcacgcg tatacctggt aatttcacta tttttaccca cgatggccat
ggctatcgat 180

ccacctgaac gcgaactttc gcgatttgcc ctgaaaacga attaccttca
35 gtcccctgat 240

gaaggcgtct atgaactggc gtttgataat gccagtaaaa aggtgtttgc
agcagtcacc 300

40 gatcgtgtaa atcgtgaagc caataaaggc tatctgtatt cgtttaattc
agattcgctg 360

aaagtcgaaa ataaatacac gatgccatac cgggcatttt cgctggcgat
aaatcaggat 420

45 aaacatcagc tctatatcgg acacacccag tcagcgtccc tgcgatatcag
tatgtttgac 480

accccaaccg gcaaactggg aagaaccagc gacaggttaa gttttaaagc
50 ggcaaacgct 540

gcagattcgc gttttgagca ttttcgccat atggttttaca gccaggattc
cgataccctg 600

5 tttgtgagtt atagcaatat gctgaaaacg gccgagggca tgaagcctct
gcataagctg 660

ttaatgctcg acgggacgac gcttgcctta aaaggcgagg ttaaggatgc
ttacaaaggt 720

10 acagcgtatg gtctgacgat ggatgaaaaa acacagaaaa tctacgttgg
cggaagagat 780

tacatcaacg aaattgatgc gaaaaatcag acgctgctgc gtaccatccc
gttgaaagat 840

15 ccgagaccac aaatcacaag tgtgcagaat ctggcgggtgg actccgcttc
tgaccgtgcc 900

20 tttgtggtgg tattcgacca tgacgatcgt tccggtacaa aagatggact
ctatatTTTT 960

gacttacgcg acggtaaaca gcttggctat gtgcacacag gagccggagc
taacgcggtg 1020

25 aaatacaatc cgaaatataa cgaactgtat gtcaccaact tcactagcgg
caccatcagc 1080

gtagtggatg ccaccaaata cagcatcacc cgtgaattta acatgccggt
ctacccaaac 1140

30 cagatggtgt tgtcggacga tatggatacc ctttacattg gcatcaaaga
aggctttaac 1200

35 cgcgattggg atcctgatgt gtttgtggaa ggagctaaag aacgtattct
gagcattgat 1260

ttgaaaaagt cg
1272

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<210> 133 <211> 163 <212> PRT <213> Escherichia coli
<400> 133

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45 Asp
1 5 10 15

Ile Lys Gly Ser Val Asp Val Gln Gly Arg Glu Gly Ser Ile Glu
50 Val
20 25 30

Val Ala Leu Asp His Asp Val Tyr Ile Pro Thr Asp Asn Asn Thr
Gly
5 35 40 45

Lys Leu Thr Gly Thr Arg Thr His Lys Pro Phe Thr Phe Thr Lys
Glu
10 50 55 60

Ile Asp Ala Ser Ser Pro Tyr Leu Tyr Lys Ala Val Thr Thr Gly
Gln
15 65 70 75 80

Thr Leu Lys Thr Ala Glu Phe Lys Phe Tyr Arg Ile Asn Asp Ala
Gly
20 85 90 95

Gln Glu Val Glu Tyr Phe Asn Ile Thr Leu Asp Asn Val Lys Leu
Val
25 100 105 110

Arg Val Ala Pro Leu Met His Asp Ile Lys Asp Pro Ser Arg Glu
Lys
30 115 120 125

His Asn His Leu Glu Arg Ile Glu Phe Arg Tyr Glu Lys Ile Thr
Trp
35 130 135 140

Thr Tyr Lys Asp Gly Asn Ile Ile His Ser Asp Ser Trp Asn Glu
Arg
40 145 150 155
160

Pro Ser Ala
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<210> 134 <211> 550 <212> PRT <213> Escherichia coli
<400> 134
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Arg Arg Ala Gly Val Asn Val Pro Trp Leu Leu Trp Ser Gly Leu
Ser

165

170

175

5 Gly Ser Pro Leu Pro Glu Arg Ala Ser Ser Pro Trp Phe Ile Cys
Thr

180

185

190

10 Gly Gly Glu Val Gln Val Ala Thr Ser Thr Glu Thr Thr Met Pro
Ala

195

200

205

15 Gln Trp Ile Ala Gln Ser Gly Val Gln Glu Arg Ser Gln Arg Leu
Cys

210

215

220

20 Tyr Leu Leu Lys Ala Glu Ser Leu Met Gln Trp Leu Asn Leu Asn
Val

225

230

235

240

25
Leu Thr Ala Leu Asn Gly Pro Glu Ala Lys Cys Pro Pro Leu Ala
Met

245

250

255

30

Thr Val Gly Leu Val Pro Ser Leu Pro Ala Val Asp Asn Asn Leu
Trp

260

265.

270

35 Gln Leu Trp Ile Thr Ala Arg Thr Gly Leu Thr Pro Asp Ile Ala
Asp

275

280

285

40

Thr Gly Thr Asp Asp Ala Leu Pro Phe Pro Asp Ala Leu Leu Arg
Gln

290

295

300

45
Leu Pro Arg Gln Ser Gly Phe Thr Pro Leu Arg Arg Ala Cys Val
Thr

305

310

315

50 320

311/370

| | | | | | | | | | | | | | | | |
|----|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 5 | Met Ser | Leu | Gly | Val | Thr | Thr | Val | Ala | Gly | Ile | Ala | Ala | Leu | Cys | Leu |
| | | | | | 325 | | | | | 330 | | | | | 335 |
| 10 | Ala His | Thr | Ala | Asn | Arg | Gln | Leu | Leu | Arg | Gln | Val | Gly | Asp | Asp | Leu |
| | | | | 340 | | | | | 345 | | | | | 350 | |
| 15 | Arg His | Phe | Tyr | Ala | Val | Pro | Val | Glu | Glu | Phe | Ile | Thr | Lys | Ala | Arg |
| | | | 355 | | | | | 360 | | | | | 365 | | |
| 20 | Leu Arg | Ser | Val | Leu | Lys | Asp | Asp | Ala | Thr | Met | Leu | Asp | Gly | Tyr | Tyr |
| | | 370 | | | | | 375 | | | | | 380 | | | |
| 25 | Glu Arg | Gly | Glu | Pro | Leu | Arg | Leu | Gly | Leu | Gly | Leu | Tyr | Pro | Gly | Glu |
| | 385 400 | | | | | 390 | | | | | 395 | | | | |
| 30 | Ile Glu | Arg | Gln | Pro | Val | Leu | Arg | Ala | Ile | Arg | Asp | Trp | Arg | Pro | Pro |
| | | | | 405 | | | | | | 410 | | | | | 415 |
| 35 | Gln Leu | Lys | Met | Glu | Val | Thr | Ala | Ser | Leu | Gln | Val | Gln | Thr | Val | Arg |
| | | | | 420 | | | | | 425 | | | | | 430 | |
| 40 | Asp Gly | Ser | Met | Ser | Leu | Phe | Asp | Val | Gly | Gln | Ala | Arg | Leu | Lys | Asp |
| | | | 435 | | | | | 440 | | | | | 445 | | |
| 45 | Ser Pro | Thr | Lys | Val | Leu | Val | Asp | Ala | Leu | Val | Asn | Ile | Arg | Ala | Lys |
| | | 450 | | | | | 455 | | | | | 460 | | | |
| 50 | Gly Glu | Trp | Leu | Ile | Leu | Val | Ala | Gly | Tyr | Thr | Asp | Ala | Thr | Gly | Asp |
| | 465 480 | | | | | 470 | | | | | 475 | | | | |

Lys Ser Asn Gln Gln Leu Ser Leu Arg Arg Ala Glu Ala Val Arg
 Asn
 5 485 490 495

Trp Met Leu Gln Thr Ser Asp Ile Pro Ala Thr Cys Phe Ala Val
 Gln
 10 500 505 510

Gly Leu Gly Glu Ser Gln Pro Ala Ala Thr Asn Asp Thr Pro Gln
 Gly
 15 515 520 525

Arg Ala Val Asn Arg Arg Val Glu Ile Ser Leu Val Pro Arg Ser
 Asp
 20 530 535 540

Ala Cys Gln Asp Val Lys
 545 550
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<210> 135 <211> 194 <212> PRT <213> Escherichia coli
 <400> 135

30 Met Ile Lys Ser Thr Phe Trp Arg Ala Leu Ala Leu Thr Ala Thr
 Leu
 1 5 10 15

35 Ile Leu Thr Gly Cys Ser His Ser Gln Pro Glu Gln Glu Gly Arg
 Pro
 20 25 30

40 Gln Ala Trp Leu Gln Pro Gly Thr Leu Ile Thr Leu Pro Ala Pro
 Gly
 35 40 45

45 Ile Ser Pro Ala Val Asn Ser Gln Gln Leu Leu Thr Gly Ser Phe
 Asn
 50 55 60

50 Gly Lys Thr Gln Ser Leu Leu Val Met Leu Asn Ala Glu Asp Gln
 Lys

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| | | | | | | | |
|----|-------------------------------------------------------------|-----|----|-----|----|-----|----|
| | 65 | | 70 | | 75 | | 80 |
| 5 | Ile Thr Leu Ala Gly Leu Ser Ser Val Gly Ile Arg Leu Phe Leu | | | | | | |
| | Val | | | | | | |
| | | 85 | | 90 | | 95 | |
| 10 | Thr Tyr Asp Ala Lys Gly Leu Arg Ala Glu Gln Ser Ile Val Val | | | | | | |
| | Pro | | | | | | |
| | | 100 | | 105 | | 110 | |
| 15 | Gln Leu Pro Pro Ala Ser Gln Val Leu Ala Asp Val Met Leu Ser | | | | | | |
| | His | | | | | | |
| | | 115 | | 120 | | 125 | |
| 20 | Trp Pro Ile Ser Ala Trp Gln Pro Gln Leu Pro Thr Gly Trp Thr | | | | | | |
| | Leu | | | | | | |
| | | 130 | | 135 | | 140 | |
| 25 | Arg Asp Asn Gly Asp Lys Arg Glu Leu Arg Asn Ala Ser Gly Lys | | | | | | |
| | Leu | | | | | | |
| | | 145 | | 150 | | 155 | |
| | | 160 | | | | | |
| 30 | Val Thr Glu Ile Thr Tyr Leu Asn Arg Gln Gly Lys Arg Val Pro | | | | | | |
| | Ile | | | | | | |
| | | 165 | | 170 | | 175 | |
| 35 | Ser Ile Glu Gln His Val Phe Lys Tyr His Ile Thr Ile Gln Tyr | | | | | | |
| | Leu | | | | | | |
| | | 180 | | 185 | | 190 | |
| 40 | Gly Asp | | | | | | |
| 45 | <210> 136 <211> 129 <212> PRT <213> Escherichia coli | | | | | | |
| | <400> 136 | | | | | | |
| 50 | Met Lys Arg Tyr Ile Lys Trp Phe Ala Ile Thr Ile Phe Ile Ser | | | | | | |
| | Met | | | | | | |
| | | 1 | | 5 | | 10 | |
| | | | | | | | 15 |

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Leu Ser Ala Cys Val Arg Thr Ala Pro Val Gln Gln Ile Ser Thr
 Thr
 20 25 30

5 Val Ser Val Gly His Thr Gln Glu Gln Val Lys Asn Ala Ile Leu
 Lys
 35 40 45

10 Ala Gly Ala Gln Arg Lys Trp Ile Met Thr Gln Val Ser Pro Gly
 Val
 50 55 60

15 Ile Lys Ala Arg Tyr Gln Thr Arg Asn His Val Ala Glu Val Arg
 Ile
 65 70 75 80

20 Thr Tyr Thr Ala Thr Tyr Tyr Asn Ile Lys Tyr Asp Ser Ser Leu
 Asn
 85 90 95

25 Leu Gln Ala Ser Asp Gly Lys Ile His Lys Asn Tyr Asn Arg Trp
 Val
 100 105 110

30 Arg Asn Leu Asp Lys Asp Ile Gln Val Asn Leu Ser Thr Gly Ala
 Thr
 115 120 125

35 Leu

40 <210> 137 <211> 415 <212> PRT <213> Escherichia coli
 <400> 137

Met Lys Arg Lys His Leu Leu Leu Leu Leu Leu Phe Ser Phe Ser
 Thr
 45 1 5 10 15

Asn Ser Ala Pro Leu Tyr Ser Leu Ile Arg Glu Ala Val Met His
 Asp
 50 20 25 30

| | | | | |
|----|--------------------------------------------------------------------|-----|-----|---------|
| 5 | Pro Ile Val Met Glu Ala Arg Ala Glu Leu Thr Ser Ala Gln Ser Arg | 35 | 40 | 45 |
| 10 | Ile Glu Gln Ala Ser Ser Ala His Trp Pro Val Val Thr Ala Thr Gly | 50 | 55 | 60 |
| 15 | Ser Lys Leu Leu Ser Gln Ser His Arg Tyr Ser Tyr Asp Tyr Asp Thr | 65 | 70 | 75 80 |
| 20 | Glu Asp Ile Leu Pro Gly Ile Arg Gly Glu Val Asn Ile Phe Ala Ser | 85 | 90 | 95 |
| 25 | Gly Ala Ile Glu Ala Asp Val Arg Arg Ser Glu Ser Glu Ala Glu Tyr | 100 | 105 | 110 |
| 30 | Tyr His Tyr Lys Met Glu Glu Thr Lys Glu Glu Thr Ile His Ser Phe | 115 | 120 | 125 |
| 35 | Val Ser Leu Tyr Leu Asp Ala Leu Arg Glu Lys Gln Ser Ile Ala Val | 130 | 135 | 140 |
| 40 | Leu Glu Gln Ser Leu Ser Arg His Asn Ala Ile Leu Asn Asp Leu Asn | 145 | 150 | 155 |
| 45 | Thr Ile Ser Ile His Asp Thr Gly Arg Glu Ser Glu Leu Val Gln Ala | 160 | 165 | 170 175 |
| 50 | Glu Ala Arg Arg Leu Met Val Arg Gln Gln Ile Asn Ser Arg Ser Arg | 180 | 185 | 190 |

| | | | | | | | | | | | | | | | | |
|----|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| 5 | Val Pro | Leu | Lys | Thr | Thr | Leu | Gly | Lys | Leu | Ser | Thr | Trp | Thr | Lys | Asn | |
| | | | 195 | | | | | 200 | | | | | 205 | | | |
| 10 | Val Ala | Thr | Glu | Ala | Asp | Leu | Glu | Asn | Pro | Phe | Ser | Arg | Met | Thr | Glu | |
| | | | 210 | | | | 215 | | | | | 220 | | | | |
| 15 | Lys Ser | Leu | Leu | Thr | Asp | Phe | Thr | Gln | Ala | Pro | Gln | Lys | Gly | Asn | Pro | |
| | 225 240 | | | | | 230 | | | | | 235 | | | | | |
| 20 | Trp Lys | Leu | Ala | Ser | Gln | Ala | Asp | Val | Glu | Ser | Lys | Lys | Ala | Ala | Leu | |
| | | | | | 245 | | | | | 250 | | | | | 255 | |
| 25 | Ala Val | Gln | Glu | Leu | Ala | Arg | Tyr | Pro | Arg | Val | Asp | Leu | Thr | Gly | Ser | |
| | | | | 260 | | | | | 265 | | | | | 270 | | |
| 30 | Thr Phe | Arg | Asp | Asp | Gln | Gln | Ile | Gly | Val | Asn | Leu | Ser | Trp | Asp | Leu | |
| | | | 275 | | | | | 280 | | | | | 285 | | | |
| 35 | Asn Val | Arg | Asn | Ala | Ser | Tyr | Gly | Val | Thr | Glu | Lys | Ala | Ala | Gln | Ile | |
| | | 290 | | | | | 295 | | | | | 300 | | | | |
| 40 | Ala Thr | Ala | Thr | Gly | Arg | Leu | Asp | Ser | Val | Ala | Arg | Met | Ile | Asp | Glu | |
| | 305 320 | | | | | 310 | | | | | 315 | | | | | |
| 45 | Gly Glu | Arg | Leu | Ser | Leu | Ile | Thr | Val | Arg | Gln | Ser | Arg | Gly | Glu | Met | |
| | | | | | 325 | | | | 330 | | | | | 335 | | |
| 50 | Thr Tyr | Leu | Arg | Arg | Gln | Glu | Gln | Ala | Ser | Ala | Arg | Val | Val | Asp | Phe | |
| | | | | | 340 | | | | 345 | | | | | 350 | | |

Arg Leu Gln Phe Gln Val Ala Arg Lys Thr Leu Ile Glu Leu Leu
 Asn
 5 355 360 365

Ala Glu Asn Glu Leu Tyr Ser Val Gly Leu Ser Arg Val Gln Thr
 Glu
 10 370 375 380

Asp Gln Met Leu His Gly Met Leu Asp Tyr Leu Tyr Ser Gln Gly
 Met
 15 385 390 395
 400

Leu Leu Lys Trp Ser Gly Val Asn Leu Ser Gly Glu Glu Glu Lys
 20 405 410 415

<210> 138 <211> 201 <212> PRT <213> Escherichia coli
 <400> 138

25 Met Lys Phe Leu Pro Leu Leu Ala Leu Leu Ile Ser Pro Phe Val
 Ser
 1 5 10 15

30 Ala Leu Thr Leu Asp Asp Leu Gln Gln Arg Phe Thr Glu Gln Pro
 Val
 20 25 30

35 Ile Arg Ala His Phe Asp Gln Thr Arg Thr Ile Lys Asp Leu Pro
 Gln
 35 40 45

40 Pro Leu Arg Ser Gln Gly Gln Met Leu Ile Ala Arg Asp Gln Gly
 Leu
 50 55 60

45 Leu Trp Asp Gln Thr Ser Pro Phe Pro Met Gln Leu Leu Leu Asp
 Asp
 65 70 75 80

50

Lys Arg Met Val Gln Val Ile Asn Gly Gln Pro Pro Gln Ile Ile
 Thr
 85 90 95

5
 Ala Glu Asn Asn Pro Gln Met Phe Gln Phe Asn His Leu Leu Arg
 Ala
 100 105 110

10
 Leu Phe Gln Ala Asp Arg Lys Val Leu Glu Gln Asn Phe Arg Val
 Glu
 115 120 125

15
 Phe Ala Asp Lys Gly Glu Gly Arg Trp Thr Leu Arg Leu Thr Pro
 Thr
 130 135 140

20
 Thr Thr Pro Leu Asp Lys Ile Phe Asn Thr Ile Asp Leu Ala Gly
 Lys
 145 150 155
 160

25
 Thr Tyr Leu Glu Ser Ile Gln Leu Asn Asp Lys Gln Gly Asp Arg
 Thr
 165 170 175

30
 Asp Ile Ala Leu Thr Gln His Gln Leu Thr Pro Ala Gln Leu Thr
 Asp
 180 185 190

35
 Asp Glu His Gln Arg Phe Ala Ala Gln
 195 200

40
 <210> 139 <211> 770 <212> PRT <213> Escherichia coli
 <400> 139

45
 Met Glu Asn Phe Phe Met Lys Asn Ser Lys Val Phe Tyr Arg Ser
 Ala
 1 5 10 15

50
 Leu Ala Thr Ala Ile Val Met Ala Leu Ser Ala Pro Ala Phe Ala
 Thr
 20 25 30

| | | | | | | | | | | | | | | | | |
|----|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| 5 | Asp Thr | Ser | Thr | Val | Ser | Thr | Asp | Pro | Val | Thr | Leu | Asn | Thr | Glu | Lys | |
| | | 35 | | | | | 40 | | | | | 45 | | | | |
| 10 | Thr Ala | Leu | Asp | Gln | Asp | Val | Val | Ile | Asn | Gly | Asp | Asn | Lys | Ile | Thr | |
| | | 50 | | | | | 55 | | | | | 60 | | | | |
| 15 | Val Phe | Thr | Ile | Glu | Thr | Ser | Asp | Ser | Asp | Lys | Asp | Leu | Asn | Val | Thr | |
| | 65 | | | | | 70 | | | | 75 | | | | | 80 | |
| 20 | Gly Val | Gly | His | Asp | Ile | Thr | Ala | Ala | Ser | Thr | Val | Asn | Gln | Asp | Phe | |
| | | | | | 85 | | | | | 90 | | | | | 95 | |
| 25 | Glu Thr | Gly | Val | Lys | Val | Ser | Gly | Asn | Lys | Asn | Val | Val | Ile | Asn | Ala | |
| | | | | 100 | | | | | 105 | | | | | 110 | | |
| 30 | Asp Ala | Ser | Thr | Ile | Thr | Ala | Gln | Gly | Glu | Gly | Thr | Tyr | Val | Arg | Thr | |
| | | | 115 | | | | | 120 | | | | | 125 | | | |
| 35 | Met Phe | Val | Ile | Asp | Ser | Thr | Gly | Asp | Val | Val | Val | Asn | Gly | Gly | Asn | |
| | | 130 | | | | | 135 | | | | | 140 | | | | |
| 40 | Val Ala | Ala | Lys | Asn | Glu | Lys | Gly | Ser | Ala | Thr | Gly | Ile | Ser | Leu | Glu | |
| | 145 | | | | | 150 | | | | | 155 | | | | | |
| | 160 | | | | | | | | | | | | | | | |
| 45 | Thr Gln | Thr | Gly | Asn | Asn | Leu | Thr | Leu | Asn | Gly | Thr | Thr | Ile | Asn | Ala | |
| | | | | | 165 | | | | | 170 | | | | 175 | | |
| 50 | Gly Lys | Asn | Lys | Ser | Tyr | Ser | Asn | Gly | Ser | Thr | Ala | Ile | Phe | Ala | Gln | |
| | | | | 180 | | | | | 185 | | | | 190 | | | |

| | | | | |
|----|----------------------------------------------------------------------------------|-----|-----|-----|
| 5 | Gly Asn Leu Leu Gln Gly Phe Asp Gly Asp Ala Thr Asp Asn Ile Thr | 195 | 200 | 205 |
| 10 | Leu Ala Asp Ser Asn Ile Ile Asn Gly Gly Ile Glu Thr Ile Val Thr | 210 | 215 | 220 |
| 15 | Ala Gly Asn Lys Thr Gly Ile His Thr Val Asn Leu Asn Ile Lys Asp 225 240 | 230 | 235 | |
| 20 | Gly Ser Val Ile Gly Ala Ala Asn Asn Lys Gln Thr Ile Tyr Ala Ser | 245 | 250 | 255 |
| 25 | Ala Ser Ala Gln Gly Ala Gly Ser Ala Thr Gln Asn Leu Asn Leu Ser | 260 | 265 | 270 |
| 30 | Val Ala Asp Ser Thr Ile Tyr Ser Asp Val Leu Ala Leu Ser Glu Ser | 275 | 280 | 285 |
| 35 | Glu Asn Ser Ala Ser Thr Thr Thr Asn Val Asn Met Asn Val Ala Arg | 290 | 295 | 300 |
| 40 | Ser Tyr Trp Glu Gly Asn Ala Tyr Thr Phe Asn Ser Gly Asp Lys Ala 305 320 | 310 | 315 | |
| 45 | Gly Ser Asp Leu Asp Ile Asn Leu Ser Asp Ser Ser Val Trp Lys Gly | 325 | 330 | 335 |
| 50 | Lys Val Ser Gly Ala Gly Asp Ala Ser Val Ser Leu Gln Asn Gly Ser | | | |

321/370

| | 340 | 345 | 350 |
|----|--------------------------------------------------------------------|---------|---------|
| 5 | Val Trp Asn Val Thr Gly Ser Ser Thr Val Asp Ala Leu Ala Val Lys | 355 | 360 365 |
| 10 | Asp Ser Thr Val Asn Ile Thr Lys Ala Thr Val Asn Thr Gly Thr Phe | 370 | 375 380 |
| 15 | Ala Ser Gln Asn Gly Thr Leu Ile Val Asp Ala Ser Ser Glu Asn Thr | 385 390 | 395 |
| 20 | Leu Asp Ile Ser Gly Lys Ala Ser Gly Asp Leu Arg Val Tyr Ser Ala | 405 | 410 415 |
| 25 | Gly Ser Leu Asp Leu Ile Asn Glu Gln Thr Ala Phe Ile Ser Thr Gly | 420 | 425 430 |
| 30 | Lys Asp Ser Thr Leu Lys Ala Thr Gly Thr Thr Glu Gly Gly Leu Tyr | 435 | 440 445 |
| 35 | Gln Tyr Asp Leu Thr Gln Gly Ala Asp Gly Asn Phe Tyr Phe Val Lys | 450 | 455 460 |
| 40 | Asn Thr His Lys Ala Ser Asn Ala Ser Ser Val Ile Gln Ala Met Ala | 465 470 | 475 |
| 45 | Ala Ala Pro Ala Asn Val Ala Asn Leu Gln Ala Asp Thr Leu Ser Ala | 485 | 490 495 |
| 50 | | | |

322/370

Arg Gln Asp Ala Val Arg Leu Ser Glu Asn Asp Lys Gly Gly Val
 Trp
 500 505 510

5
 Ile Gln Tyr Phe Gly Gly Lys Gln Lys His Thr Thr Ala Gly Asn
 Ala
 515 520 525

10
 Ser Tyr Asp Leu Asp Val Asn Gly Val Met Leu Gly Gly Asp Thr
 Arg
 530 535 540

15
 Phe Met Thr Glu Asp Gly Ser Trp Leu Ala Gly Val Ala Met Ser
 Ser
 545 550 555
 560

20
 Ala Lys Gly Asp Met Thr Thr Met Gln Ser Lys Gly Asp Thr Glu
 Gly
 565 570 575

25
 Tyr Ser Phe His Ala Tyr Leu Ser Arg Gln Tyr Asn Asn Gly Ile
 Phe
 580 585 590

30
 Ile Asp Thr Ala Ala Gln Phe Gly His Tyr Ser Asn Thr Ala Asp
 Val
 595 600 605

35
 Arg Leu Met Asn Gly Gly Gly Thr Ile Lys Ala Asp Phe Asn Thr
 Asn
 610 615 620

40
 Gly Phe Gly Ala Met Val Lys Gly Gly Tyr Thr Trp Lys Asp Gly
 Asn
 625 630 635
 640

45
 Gly Leu Phe Ile Gln Pro Tyr Ala Lys Leu Ser Ala Leu Thr Leu
 Glu
 645 650 655

Gly Val Asp Tyr Gln Leu Asn Gly Val Asp Val His Ser Asp Ser
 Tyr
 660 665 670
 5

Asn Ser Val Leu Gly Glu Ala Gly Thr Arg Val Gly Tyr Asp Phe
 Ala
 675 680 685
 10

Val Gly Asn Ala Thr Val Lys Pro Tyr Leu Asn Leu Ala Ala Leu
 Asn
 690 695 700
 15

Glu Phe Ser Asp Gly Asn Lys Val Arg Leu Gly Asp Glu Ser Val
 Asn
 705 710 715
 720
 20

Ala Ser Ile Asp Gly Ala Ala Phe Arg Val Gly Ala Gly Val Gln
 Ala
 725 730 735
 25

Asp Ile Thr Lys Asn Met Gly Ala Tyr Ala Ser Leu Asp Tyr Thr
 Lys
 740 745 750
 30

Gly Asp Asp Ile Glu Asn Pro Leu Gln Gly Val Val Gly Ile Asn
 Val
 755 760 765
 35

Thr Trp
 770
 40

<210> 140 <211> 660 <212> PRT <213> Escherichia coli
 <400> 140

45 Met Ser Arg Pro Gln Phe Thr Ser Leu Arg Leu Ser Leu Leu Ala
 Leu
 1 5 10 15

50 Ala Val Ser Ala Thr Leu Pro Thr Phe Ala Phe Ala Thr Glu Thr
 Met

324/370

| | | | | | | | |
|----|--------------------------------------------------------------------|----|-----|----|-----|----|-----|
| | | 20 | | 25 | | 30 | |
| 5 | Thr Val Thr Ala Thr Gly Asn Ala Arg Ser Ser Phe Glu Ala Pro Met | 35 | | 40 | | 45 | |
| 10 | Met Val Ser Val Ile Asp Thr Ser Ala Pro Glu Asn Gln Thr Ala Thr | 50 | | 55 | | 60 | |
| 15 | Ser Ala Thr Asp Leu Leu Arg His Val Pro Gly Ile Thr Leu Asp Gly | 65 | | 70 | | 75 | 80 |
| 20 | Thr Gly Arg Thr Asn Gly Gln Asp Val Asn Met Arg Gly Tyr Asp His | | 85 | | 90 | | 95 |
| 25 | Arg Gly Val Leu Val Leu Val Asp Gly Val Arg Gln Gly Thr Asp Thr | | 100 | | 105 | | 110 |
| 30 | Gly His Leu Asn Gly Thr Phe Leu Asp Pro Ala Leu Ile Lys Arg Val | | 115 | | 120 | | 125 |
| 35 | Glu Ile Val Arg Gly Pro Ser Ala Leu Leu Tyr Gly Ser Gly Ala Leu | | 130 | | 135 | | 140 |
| 40 | Gly Gly Val Ile Ser Tyr Asp Thr Val Asp Ala Lys Asp Leu Leu Gln | | 145 | | 150 | | 155 |
| | | | 160 | | | | |
| 45 | Glu Gly Gln Ser Ser Gly Phe Arg Val Phe Gly Thr Gly Gly Thr Gly | | 165 | | 170 | | 175 |
| 50 | Asp His Ser Leu Gly Leu Gly Ala Ser Ala Phe Gly Arg Thr Glu Asn | | | | | | |

325/370

| | 180 | 185 | 190 |
|----|-----------------------------------------------------------------|-----|-----|
| 5 | Leu Asp Gly Ile Val Ala Trp Ser Ser Arg Asp Arg Gly Asp Leu Arg | | |
| | 195 | 200 | 205 |
| 10 | Gln Ser Asn Gly Glu Thr Ala Pro Asn Asp Glu Ser Ile Asn Asn Met | | |
| | 210 | 215 | 220 |
| 15 | Leu Ala Lys Gly Thr Trp Gln Ile Asp Ser Ala Gln Ser Leu Ser Gly | | |
| | 225 | 230 | 235 |
| | 240 | | |
| 20 | Leu Val Arg Tyr Tyr Asn Asn Asp Ala Arg Glu Pro Lys Asn Pro Gln | | |
| | 245 | 250 | 255 |
| 25 | Thr Val Glu Ala Ser Asp Ser Ser Asn Pro Met Val Asp Arg Ser Thr | | |
| | 260 | 265 | 270 |
| 30 | Ile Gln Arg Asp Ala Gln Leu Ser Tyr Lys Leu Ala Pro Gln Gly Asn | | |
| | 275 | 280 | 285 |
| 35 | Asp Trp Leu Asn Ala Asp Ala Lys Ile Tyr Trp Ser Glu Val Arg Ile | | |
| | 290 | 295 | 300 |
| 40 | Asn Ala Gln Asn Thr Gly Ser Ser Gly Glu Tyr Arg Glu Gln Ile Thr | | |
| | 305 | 310 | 315 |
| | 320 | | |
| 45 | Lys Gly Ala Arg Leu Glu Asn Arg Ser Thr Leu Phe Ala Asp Ser Phe | | |
| | 325 | 330 | 335 |
| 50 | | | |

326/370

| | | | | | | | | | | | | | | | | |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| | Ala | Ser | His | Leu | Leu | Thr | Tyr | Gly | Gly | Glu | Tyr | Tyr | Arg | Gln | Glu | |
| | Gln | | | | | | | | | | | | | | | |
| | | | | | 340 | | | | | 345 | | | | | 350 | |
| 5 | His | Pro | Gly | Gly | Ala | Thr | Thr | Gly | Phe | Pro | Gln | Ala | Lys | Ile | Asp | |
| | Phe | | | | | | | | | | | | | | | |
| | | | | | 355 | | | | | 360 | | | | | 365 | |
| 10 | Ser | Ser | Gly | Trp | Leu | Gln | Asp | Glu | Ile | Thr | Leu | Arg | Asp | Leu | Pro | |
| | Ile | | | | | | | | | | | | | | | |
| | | | | | 370 | | | | | 375 | | | | | 380 | |
| 15 | Thr | Leu | Leu | Gly | Gly | Thr | Arg | Tyr | Asp | Ser | Tyr | Arg | Gly | Ser | Ser | |
| | Asp | | | | | | | | | | | | | | | |
| | 385 | | | | | | 390 | | | | | | 395 | | | |
| | 400 | | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | | | |
| | Gly | Tyr | Lys | Asp | Val | Asp | Ala | Asp | Lys | Trp | Ser | Ser | Arg | Ala | Gly | |
| | Met | | | | | | | | | | | | | | | |
| | | | | | 405 | | | | | 410 | | | | | 415 | |
| 25 | | | | | | | | | | | | | | | | |
| | Thr | Ile | Asn | Pro | Thr | Asn | Trp | Leu | Met | Leu | Phe | Gly | Ser | Tyr | Ala | |
| | Gln | | | | | | | | | | | | | | | |
| | | | | | 420 | | | | | 425 | | | | | 430 | |
| 30 | | | | | | | | | | | | | | | | |
| | Ala | Phe | Arg | Ala | Pro | Thr | Met | Gly | Glu | Met | Tyr | Asn | Asp | Ser | Lys | |
| | His | | | | | | | | | | | | | | | |
| | | | | | 435 | | | | | 440 | | | | | 445 | |
| 35 | | | | | | | | | | | | | | | | |
| | Phe | Ser | Ile | Gly | Arg | Phe | Tyr | Thr | Asn | Tyr | Trp | Val | Pro | Asn | Pro | |
| | Asn | | | | | | | | | | | | | | | |
| | | | | | 450 | | | | | 455 | | | | | 460 | |
| 40 | | | | | | | | | | | | | | | | |
| | Leu | Arg | Pro | Glu | Thr | Asn | Glu | Thr | Gln | Glu | Tyr | Gly | Phe | Gly | Leu | |
| | Arg | | | | | | | | | | | | | | | |
| | 465 | | | | | | 470 | | | | | 475 | | | | |
| 45 | | | | | | | | | | | | | | | | |
| | 480 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | Phe | Asp | Asp | Leu | Met | Leu | Ser | Asn | Asp | Ala | Leu | Glu | Phe | Lys | Ala | |
| | Ser | | | | | | | | | | | | | | | |
| 50 | | | | | | | | | | | | | | | | |
| | | | | | 485 | | | | | 490 | | | | | 495 | |

| | | | | |
|----|--------------------------------------------------------------------|-----|-----|-----|
| | Tyr Phe Asp Thr Lys Ala Lys Asp Tyr Ile Ser Thr Thr Val Asp Phe | | | |
| 5 | | 500 | 505 | 510 |
| | Ala Ala Ala Thr Thr Met Ser Tyr Asn Val Pro Asn Ala Lys Ile Trp | | | |
| 10 | | 515 | 520 | 525 |
| | Gly Trp Asp Val Met Thr Lys Tyr Thr Thr Asp Leu Phe Ser Leu Asp | | | |
| 15 | | 530 | 535 | 540 |
| | Val Ala Tyr Asn Arg Thr Arg Gly Lys Asp Thr Asp Thr Gly Glu Tyr | | | |
| 20 | | 545 | 550 | 555 |
| | | 560 | | |
| | Ile Ser Ser Ile Asn Pro Asp Thr Val Thr Ser Thr Leu Asn Ile Pro | | | |
| 25 | | 565 | 570 | 575 |
| | Ile Ala His Ser Gly Phe Ser Val Gly Trp Val Gly Thr Phe Ala Asp | | | |
| 30 | | 580 | 585 | 590 |
| | Arg Ser Thr His Ile Ser Ser Ser Tyr Ser Lys Gln Pro Gly Tyr Gly | | | |
| 35 | | 595 | 600 | 605 |
| | Val Asn Asp Phe Tyr Val Ser Tyr Gln Gly Gln Gln Ala Leu Lys Gly | | | |
| 40 | | 610 | 615 | 620 |
| | Met Thr Thr Thr Leu Val Leu Gly Asn Ala Phe Asp Lys Glu Tyr Trp | | | |
| 45 | | 625 | 630 | 635 |
| | | 640 | | |
| | Ser Pro Gln Gly Ile Pro Gln Asp Gly Arg Asn Gly Lys Ile Phe Val | | | |
| 50 | | 645 | 650 | 655 |

Ser Tyr Gln Trp
660

5

<210> 141 <211> 719 <212> PRT <213> Escherichia coli
<400> 141

10 Met Arg Asp Glu Met Leu Tyr Asn Ile Pro Cys Arg Ile Tyr Ile
Leu
1 5 10 15

15 Ser Thr Leu Ser Leu Cys Ile Ser Gly Ile Val Ser Thr Ala Thr
Ala
20 25 30

20 Thr Ser Ser Glu Thr Lys Ile Ser Asn Glu Glu Thr Leu Val Val
Thr
35 40 45

25 Thr Asn Arg Ser Ala Ser Asn Leu Trp Glu Ser Pro Ala Thr Ile
Gln
50 55 60

30 Val Ile Asp Gln Gln Thr Leu Gln Asn Ser Thr Asn Ala Ser Ile
Ala
65 70 75 80

35 Asp Asn Leu Gln Asp Ile Pro Gly Val Glu Ile Thr Asp Asn Ser
Leu
85 90 95

40 Ala Gly Arg Lys Gln Ile Arg Ile Arg Gly Glu Ala Ser Ser Arg
Val
100 105 110

45 Leu Ile Leu Ile Asp Gly Gln Glu Val Thr Tyr Gln Arg Ala Gly
Asp
115 120 125

50 Asn Tyr Gly Val Gly Leu Leu Ile Asp Glu Ser Ala Leu Glu Arg
Val

| | 130 | 135 | 140 |
|----|----------------------------------------------------------------------------------|-----|-----|
| 5 | Glu Val Val Lys Gly Pro Tyr Ser Val Leu Tyr Gly Ser Gln Ala Ile 145 160 | 150 | 155 |
| 10 | Gly Gly Ile Val Asn Phe Ile Thr Lys Lys Gly Gly Asp Lys Leu Ala 165 | 170 | 175 |
| 15 | Ser Gly Val Val Lys Ala Val Tyr Asn Ser Ala Thr Ala Gly Trp Glu 180 | 185 | 190 |
| 20 | Glu Ser Ile Ala Val Gln Gly Ser Ile Gly Gly Phe Asp Tyr Arg Ile 195 | 200 | 205 |
| 25 | Asn Gly Ser Tyr Ser Asp Gln Gly Asn Arg Asp Thr Pro Asp Gly Arg 210 | 215 | 220 |
| 30 | Leu Pro Asn Thr Asn Tyr Arg Asn Asn Ser Gln Gly Val Trp Leu Gly 225 240 | 230 | 235 |
| 35 | Tyr Asn Ser Gly Asn His Arg Phe Gly Leu Ser Leu Asp Arg Tyr Arg 245 | 250 | 255 |
| 40 | Leu Ala Thr Gln Thr Tyr Tyr Glu Asp Pro Asp Gly Ser Tyr Glu Ala 260 | 265 | 270 |
| 45 | Phe Ser Val Lys Ile Pro Lys Leu Glu Arg Glu Lys Val Gly Val Phe 275 | 280 | 285 |
| 50 | | | |

| | | | | |
|----|--------------------------------------------------------------------|-----|-----|-----|
| | Tyr Asp Thr Asp Val Asp Gly Asp Tyr Leu Lys Lys Ile His Phe Asp | 290 | 295 | 300 |
| 5 | Ala Tyr Glu Gln Thr Ile Gln Arg Gln Phe Ala Asn Glu Val Lys Thr | 305 | 310 | 315 |
| | | 320 | | |
| 10 | | | | |
| | Thr Gln Pro Val Pro Ser Pro Met Ile Gln Ala Leu Thr Val His Asn | 325 | 330 | 335 |
| 15 | | | | |
| | Lys Thr Asp Thr His Asp Lys Gln Tyr Thr Gln Ala Val Thr Leu Gln | 340 | 345 | 350 |
| 20 | | | | |
| | Ser His Phe Ser Leu Pro Ala Asn Asn Glu Leu Val Thr Gly Ala Gln | 355 | 360 | 365 |
| 25 | | | | |
| | Tyr Lys Gln Asp Arg Val Ser Gln Arg Ser Gly Gly Met Thr Ser Ser | 370 | 375 | 380 |
| 30 | | | | |
| | Lys Ser Leu Thr Gly Phe Ile Asn Lys Glu Thr Arg Thr Arg Ser Tyr | 385 | 390 | 395 |
| 35 | | 400 | | |
| | | | | |
| | Tyr Glu Ser Glu Gln Ser Thr Val Ser Leu Phe Ala Gln Asn Asp Trp | 405 | 410 | 415 |
| 40 | | | | |
| | Arg Phe Ala Asp His Trp Thr Trp Thr Met Gly Val Arg Gln Tyr Trp | 420 | 425 | 430 |
| 45 | | | | |
| | Leu Ser Ser Lys Leu Thr Arg Gly Asp Gly Val Ser Tyr Thr Ala Gly | 435 | 440 | 445 |
| 50 | | | | |

| | |
|----|-------------------------------------------------------------------------------------------|
| 5 | Ile Ile Ser Asp Thr Ser Leu Ala Arg Glu Ser Ala Ser Asp His Glu 450 455 460 |
| 10 | Met Val Thr Ser Thr Ser Leu Arg Tyr Ser Gly Phe Asp Asn Leu Glu 465 470 475 480 |
| 15 | Leu Arg Ala Ala Phe Ala Gln Gly Tyr Val Phe Pro Thr Leu Ser Gln 485 490 495 |
| 20 | Leu Phe Met Gln Thr Ser Ala Gly Gly Ser Val Thr Tyr Gly Asn Pro 500 505 510 |
| 25 | Asp Leu Lys Ala Glu His Ser Asn Asn Phe Glu Leu Gly Ala Arg Tyr 515 520 525 |
| 30 | Asn Gly Asn Thr Trp Leu Ile Asp Ser Ala Val Tyr Tyr Ser Glu Ala 530 535 540 |
| 35 | Lys Asp Tyr Ile Ala Ser Leu Ile Cys Asp Gly Ser Ile Val Cys. Asn 545 550 555 560 |
| 40 | Gly Asn Thr Asn Ser Ser Arg Ser Ser Tyr Tyr Tyr Tyr Asp Asn Ile 565 570 575 |
| 45 | Asp Arg Ala Lys Thr Trp Gly Leu Glu Ile Ser Ala Glu Tyr Asn Gly 580 585 590 |
| 50 | Trp Val Phe Ser Pro Tyr Ile Ser Gly Asn Leu Ile Arg Arg Gln Tyr 595 600 605 |

Glu Thr Ser Thr Leu Lys Thr Thr Asn Thr Gly Glu Pro Ala Ile
 Asn
 5 610 615 620

Gly Arg Ile Gly Leu Lys His Thr Leu Val Met Gly Gln Ala Asn
 Ile
 10 625 630 635
 640

Ile Ser Asp Val Phe Ile Arg Ala Ala Ser Ser Ala Lys Asp Asp
 Ser
 15 645 650 655

Asn Gly Thr Glu Thr Asn Val Pro Gly Trp Ala Thr Leu Asn Phe
 Ala
 20 660 665 670

Val Asn Thr Glu Phe Gly Asn Glu Asp Gln Ser Arg Ile Asn Leu
 Ala
 25 675 680 685

Leu Asn Asn Leu Thr Asp Lys Arg Tyr Arg Thr Ala His Glu Thr
 Ile
 30 690 695 700

Pro Ala Ala Gly Phe Asn Ala Ala Ile Gly Phe Val Trp Asn Phe
 35 705 710 715

<210> 142 <211> 199 <212> PRT <213> Escherichia coli
 <400> 142
 40

Met Arg Lys Val Cys Ala Val Ile Leu Ser Ala Ala Ile Cys Leu
 Ser
 1 5 10 15

Val Ser Gly Ala Pro Ala Trp Ala Ser Glu His Gln Ser Thr Leu
 Ser
 45 20 25 30

50

Ala Gly Tyr Leu His Ala Arg Thr Asn Ala Pro Gly Ser Asp Asn
Leu
35 40 45

5 . Asn Gly Ile Asn Val Lys Tyr Arg Tyr Glu Phe Thr Asp Ala Leu
Gly
50 55 60

10 Leu Ile Thr Ser Phe Ser Tyr Ala Asn Ala Glu Asp Glu Gln Lys
Thr
65 70 75 80

15 His Tyr Ser Asp Thr Arg Trp His Glu Asp Ser Val Arg Asn Arg
Trp
85 90 95

20 Phe Ser Val Met Ala Gly Pro Ser Val Arg Val Asn Glu Trp Phe
Ser
100 105 110

25 Ala Tyr Ser Met Ala Gly Val Ala Tyr Ser Arg Val Ser Thr Phe
Ser
115 120 125

30 Gly Asp Tyr Leu Arg Val Thr Asp Asn Lys Gly Lys Thr His Asp
Val
130 135 140

```

35      Leu Thr Gly Ser Asp Asp Gly Arg  His Ser Asn Thr Ser Leu Ala
      Trp
      145              150              155
      160

```

40

Gly Ala Gly Val Gln Phe Asn Pro Thr Glu Ser Val Thr Ile Asp
Leu

165 170 175

45
Ala Tyr Glu Gly Ser Gly Ser Gly Asp Trp Arg Thr Asp Ala Phe
Ile
180 185 190

50

Val Gly Ile Gly Tyr Arg Phe
195

5 <210> 143 <211> 456 <212> PRT <213> Escherichia coli
<400> 143

Met Lys Lys Ser Thr Leu Ser Leu Ala Ile Gly Leu Leu Leu Ala
Cys
10 1 5 10 15

Ser Thr Gly Met Ala Lys Thr Gln His Leu Thr Leu Glu Gln Arg
Leu
15 20 25 30

Glu Ala Ala Glu Met Arg Ala Ala Lys Ala Glu Gly Gln Val Lys
Gln
20 35 40 45

Leu Gln Thr Gln Gln Ala Ala Glu Ile Arg Glu Ile Lys Thr Ala
Gln
25 50 55 60

Gly Asn Thr Pro Val Asn Gly Gln Ser Thr Thr Glu Ser Glu Lys
Lys
30 65 70 75 80

Asn Ala Thr Pro Pro Asn Leu Leu Leu Ser Gly Tyr Gly Asp Leu
Lys
35 85 90 95

Ile Tyr Gly Asp Val Glu Phe Asn Met Asp Ala Glu Ser Asn His
Gly
40 100 105 110

Leu Leu Ala Met Thr Asn Ala Asp Val Asn Ser Asp Pro Thr Asn
Glu
45 115 120 125

Trp Asn Leu Asn Gly Arg Ile Leu Leu Gly Phe Asp Gly Met Arg
Lys
50 130 135 140

| | | |
|----|-------------------------------------------------------------|-------------|
| | Leu Asp Asn Gly Tyr Phe Ala Gly Phe Ser Ala Gln Pro Leu Gly | |
| | Asp | |
| | 145 | 150 155 |
| 5 | 160 | |
| | Met His Gly Ser Val Asn Ile Asp Asp Ala Val Phe Phe Phe Gly | |
| | Lys | |
| 10 | | 165 170 175 |
| | Glu Asn Asp Trp Lys Val Lys Val Gly Arg Phe Glu Ala Tyr Asp | |
| | Met | |
| 15 | | 180 185 190 |
| | Phe Pro Leu Asn Gln Asp Thr Phe Val Glu His Ser Gly Asn Thr | |
| | Ala | |
| 20 | | 195 200 205 |
| | Asn Asp Leu Tyr Asp Asp Gly Ser Gly Tyr Ile Tyr Met Met Lys | |
| | Glu | |
| 25 | | 210 215 220 |
| | Gly Arg Gly Arg Ser Asn Ala Gly Gly Asn Phe Leu Val Ser Lys | |
| | Gln | |
| 30 | | 225 230 235 |
| | 240 | |
| | Leu Asp Asn Trp Tyr Phe Glu Leu Asn Thr Leu Leu Glu Asp Gly | |
| | Thr | |
| 35 | | 245 250 255 |
| | Ser Leu Tyr Asn Asp Gly Asn Tyr His Gly Arg Asp Met Glu Gln | |
| | Gln | |
| 40 | | 260 265 270 |
| | Lys Asn Val Ala Tyr Leu Arg Pro Val Ile Ala Trp Ser Pro Thr | |
| | Glu | |
| 45 | | 275 280 285 |
| | Glu Phe Thr Val Ser Ala Ala Met Glu Ala Asn Val Val Asn Asn | |
| | Ala | |
| 50 | | 290 295 300 |

| | | |
|----|-------------------------------------------------------------|-------------|
| | Tyr Gly Tyr Thr Asp Ser Lys Gly Asn Phe Val Asp Gln Ser Asp | |
| 5 | Arg 305 320 | 310 315 |
| 10 | Thr Gly Tyr Gly Met Ser Met Thr Trp Asn Gly Leu Lys Thr Asp | |
| | Pro | 325 330 335 |
| 15 | Glu Asn Gly Ile Val Val Asn Leu Asn Thr Ala Tyr Leu Asp Ala | |
| | Asn | 340 345 350 |
| 20 | Asn Glu Lys Asp Phe Thr Ala Gly Ile Asn Ala Leu Trp Lys Arg | |
| | Phe | 355 360 365 |
| 25 | Glu Leu Gly Tyr Ile Tyr Ala His Asn Lys Ile Asp Glu Phe Ser | |
| | Gly | 370 375 380 |
| 30 | Val Val Cys Asp Asn Asp Cys Trp Ile Asp Asp Glu Gly Thr Tyr | |
| | Asn | 385 390 395 |
| | 400 | |
| 35 | Ile His Thr Ile His Ala Ser Tyr Gln Phe Ala Asn Val Met Asp | |
| | Met | 405 410 415 |
| 40 | Glu Asn Phe Asn Ile Tyr Leu Gly Thr Tyr Tyr Ser Ile Leu Asp | |
| | Ser | 420 425 430 |
| 45 | Asp Gly Asp Lys Ile His Gly Asp Asp Ser Asp Asp Arg Tyr Gly | |
| | Ala | 435 440 445 |
| 50 | Arg Val Arg Phe Lys Tyr Phe Phe | |
| | | 450 455 |

<210> 144 <211> 174 <212> PRT <213> Escherichia coli
<400> 144

5

Met Asn Gly Lys Ala Phe Leu Ala Cys Val Leu Met Ser Val Val
Leu
1 5 10 15

10

Thr Gly Cys Glu Thr Ala Lys Lys Ile Ser Gln Val Ile Arg Asn
Pro
20 25 30

15

Asp Ile Gln Val Gly Lys Leu Met Asp Gln Ser Thr Glu Leu Thr
Val
35 40 45

20

Thr Leu Leu Thr Glu Pro Asp Ser Asn Leu Thr Ala Asp Gly Glu
Ala
50 55 60

25

Ala Pro Val Asp Val Gln Leu Val Tyr Leu Ser Asp Asp Ser Lys
Phe
65 70 75 80

30

His Ala Ala Asp Tyr Asp Gln Val Ala Thr Thr Ala Leu Pro Asp
Val
85 90 95

35

Leu Gly Lys Asn Tyr Ile Asp His Gln Asp Phe Asn Leu Leu Pro
Asp
100 105 110

40

Thr Val Lys Thr Leu Pro Pro Ile Lys Leu Asp Glu Lys Thr Gly
Tyr
115 120 125

45

Ile Gly Val Ile Ala Tyr Phe Ser Asp Asp Gln Ala Thr Glu Trp
Lys
130 135 140

50

Gln Ile Glu Ser Val Glu Ser Ile Gly His His Tyr Arg Leu Leu
 Val
 145 150 155
 160
 5

His Ile Arg Ala Ser Ala Ile Glu Met Lys Lys Glu Glu Asn
 165 170

10
 <210> 145 <211> 1144 <212> PRT <213> Escherichia coli
 <400> 145

15
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 Asn
 20 25 30

25
 Arg Trp Leu Ala Thr Ala Val Trp Gly Leu Ile Ala Leu Val Trp
 Leu
 35 40 45

30
 Thr Trp Arg Val Met Lys Arg Leu Gln Lys Leu Glu Lys Gln Gln
 Lys
 50 55 60

35
 Gln Gln Arg Glu Glu Glu Lys Asp Pro Leu Thr Val Glu Leu His
 Arg
 65 70 75 80

40
 Gln Gln Gln Tyr Leu Asp His Trp Leu Leu Arg Leu Arg Arg His
 Leu
 85 90 95

45
 Asp Asn Arg Arg Tyr Leu Trp Gln Leu Pro Trp Tyr Met Val Ile
 Gly
 100 105 110

50
 Pro Ala Gly Ser Gly Lys Ser Thr Leu Leu Arg Glu Gly Phe Pro
 Ser
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Asp Ile Val Tyr Thr Pro Glu Ser Ile Arg Gly Val Glu Tyr His
 Pro
 5 130 135 140

Leu Ile Thr Pro Arg Val Gly Asn Gln Ala Val Ile Phe Asp Val
 Asp
 10 145 150 155
 160

Gly Val Leu Thr Thr Pro Gly Gly Asp Asp Leu Leu Arg Arg Arg
 Leu
 15 165 170 175

Arg Glu His Trp Leu Gly Trp Leu Met Gln Thr Arg Ala Arg Gln
 Pro
 20 180 185 190

Leu Asn Gly Leu Ile Leu Thr Leu Asp Leu Pro Asp Leu Leu Thr
 Ala
 25 195 200 205

Asp Lys Ser Arg Arg Glu Thr Leu Val Gln Asn Leu Arg Gln Gln
 Leu
 30 210 215 220

Gln Glu Ile Arg Gln Ser Leu His Cys Arg Leu Pro Val Tyr Val
 Val
 35 225 230 235
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Leu Thr Arg Leu Asp Leu Leu Asn Gly Phe Ala Ala Leu Phe His
 Ser
 40 245 250 255

Leu Asp Lys Lys Asp Arg Asp Ala Ile Leu Gly Val Thr Phe Thr
 Arg
 45 260 265 270

Arg Ala His Glu Ser Asp Gly Trp Arg Ser Glu Leu Gly Ala Phe
 Trp
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275

280

285

| | | | | |
|----|----------------------------------------------------------------------------------|-----|-----|-----|
| 5 | Gln Thr Trp Val Gln Gln Val Asn Leu Ala Leu Ser Asp Leu Val Leu | 290 | 295 | 300 |
| 10 | Ala Gln Thr Gly Ala Ala Pro Arg Ser Ala Val Phe Ser Phe Ser Arg 305 320 | 310 | 315 | |
| 15 | Gln Met Gln Gly Thr Gly Glu Ile Val Thr Ala Leu Leu Ala Ala Leu | 325 | 330 | 335 |
| 20 | Leu Asp Gly Glu Asn Met Asp Val Met Leu Arg Gly Val Trp Leu Thr | 340 | 345 | 350 |
| 25 | Ser Ser Leu Gln Arg Gly Gln Val Asp Asp Ile Phe Thr Gln Ser Ala | 355 | 360 | 365 |
| 30 | Ala Arg Gln Tyr Gly Leu Gly Asn Ser Ser Leu Ala Thr Trp Pro Leu | 370 | 375 | 380 |
| 35 | Val Glu Thr Thr Pro Tyr Phe Thr Arg Arg Leu Phe Pro Glu Val Leu 385 400 | 390 | 395 | |
| 40 | Leu Ala Glu Pro Asn Leu Ala Gly Glu Asn Ser Val Trp Leu Asn Ser | 405 | 410 | 415 |
| 45 | Ser Arg Arg Arg Leu Thr Ala Phe Ser Thr Cys Gly Ala Ala Leu Ala | 420 | 425 | 430 |

50

Ala Leu Met Val Gly Ser Trp His His Tyr Tyr Asn Gln Asn Trp
Gln
435 440 445

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Pro
450 455 460

10 Pro Pro Gln Gly Thr Asp Glu Phe Gly Asn Leu Gln Leu Pro Leu
Leu
465 470 475
480

15

Asn Pro Val Arg Asp Ala Thr Leu Ala Tyr Gly Asp Tyr Arg Asp
His

485 490 495

20

Gly Phe Leu Ala Asp Met Gly Leu Tyr Gln Gly Ala Arg Val Gly
Pro

500 505 510

25 Tyr Val Glu Gln Thr Tyr Ile Gln Leu Leu Glu Gln Arg Tyr Leu
Pro
515 520 525

30

Ser Leu Met Asn Gly Leu Ile Arg Asp Leu Asn Ile Ala Pro Pro
Glu

530 535 540

35 Ser Glu Glu Lys Leu Ala Val Leu Arg Val Val Arg Met Met Glu
Asp
545 550 555
40 560

Lys Ser Gly Arg Asn Asn Glu Ala Val Lys Gln Tyr Met Ala Arg
Arg
45 565 570 575

Trp Ser Asn Glu Phe His Gly Gln Arg Asp Ile Gln Ala Gln Leu
Met

50 580 585 590

| | | | | |
|----|-----------------------------------------------------------------|-----|-----|-----|
| 5 | Val His Leu Asp Tyr Ala Leu Glu His Thr Asp Trp His Ala Gln Arg | 595 | 600 | 605 |
| 10 | Gln Ser Ser Asp Ser Asp Ala Val Ser Arg Trp Thr Pro Tyr Asp Lys | 610 | 615 | 620 |
| 15 | Pro Ile Ile Asn Ala Gln Gln Glu Leu Ser Lys Leu Pro Ile Tyr Gln | 625 | 630 | 635 |
| | 640 | | | |
| 20 | Arg Val Tyr Gln Thr Leu Arg Thr Lys Ala Leu Ser Val Leu Pro Ala | 645 | 650 | 655 |
| 25 | Asp Leu Asn Leu Arg Asp Gln Val Gly Pro Thr Phe Asp Asn Val Phe | 660 | 665 | 670 |
| 30 | Val Ala Gly Asn Asp Glu Lys Leu Val Ile Pro Gln Phe Leu Thr Arg | 675 | 680 | 685 |
| 35 | Tyr Gly Leu Gln Ser Tyr Phe Val Lys Gln Arg Glu Gly Leu Val Glu | 690 | 695 | 700 |
| 40 | Leu Thr Ala Leu Asp Ser Trp Val Leu Asn Leu Thr Gln Ser Val Ala | 705 | 710 | 715 |
| | 720 | | | |
| 45 | Tyr Ser Glu Ala Asp Arg Glu Glu Ile Gln Arg His Ile Thr Glu Gln | 725 | 730 | 735 |
| 50 | Tyr Ile Ser Asp Tyr Thr Ala Thr Trp Arg Ala Gly Met Asp Asn Leu | 740 | 745 | 750 |

| | | | | |
|----|--------------------------------------------------------------------|------------|-----|-----|
| 5 | Asn Val Arg Asp Tyr Glu Ala Met Ser Ala Leu Thr Asp Ala Leu Glu | 755 | 760 | 765 |
| 10 | Gln Ile Ile Ser Gly Asp Gln Pro Phe Gln Arg Ala Leu Thr Ala Leu | 770 | 775 | 780 |
| 15 | Arg Asp Asn Thr His Ala Leu Thr Leu Ser Gly Lys Leu Asp Asp Lys | 785 800 | 790 | 795 |
| 20 | Ala Arg Glu Ala Ala Ile Asn Glu Met Asp Tyr Arg Leu Leu Ser Arg | 805 | 810 | 815 |
| 25 | Leu Gly His Glu Phe Ala Pro Glu Asn Ser Ala Leu Glu Glu Gln Lys | 820 | 825 | 830 |
| 30 | Asp Lys Ala Ser Thr Leu Gln Ala Val Tyr Gln Gln Leu Thr Glu Leu | 835 | 840 | 845 |
| 35 | His Arg Tyr Leu Leu Ala Ile Gln Asn Ser Pro Val Pro Gly Lys Ser | 850 | 855 | 860 |
| 40 | Ala Leu Lys Ala Val Gln Leu Arg Leu Asp Gln Asn Ser Ser Asp Pro | 865 880 | 870 | 875 |
| 45 | Ile Phe Ala Thr Arg Gln Met Ala Lys Thr Leu Pro Ala Pro Leu Asn | 885 | 890 | 895 |
| 50 | Arg Trp Val Gly Lys Leu Ala Asp Gln Ala Trp His Val Val Met Val | | | |

900

905

910

5 Glu Ala Val Arg Tyr Met Glu Val Asp Trp Arg Asp Asn Val Val
Lys

915

920

925

10 Pro Phe Asn Glu Gln Leu Ala Asp Asn Tyr Pro Phe Asn Pro Arg
Ala

930

935

940

15 Thr Gln Asp Ala Ser Leu Asp Ser Phe Glu Arg Phe Phe Lys Pro
Asp
945
960

950

955

20 Gly Ile Leu Asp Asn Phe Tyr Lys Asn Asn Leu Arg Leu Phe Leu
Glu

965

970

975

25 Asn Asp Leu Thr Phe Gly Asp Asp Gly Arg Val Leu Ile Arg Glu
Asp

980

985

990

30 Ile Arg Gln Gln Leu Asp Thr Ala Gln Lys Ile Arg Asp Ile Phe
Phe

995

1000

1005

35 Ser Gln Gln Asn Gly Leu Gly Ala Gln Phe Ala Val Glu Thr Val
1010 1015 1020

40 Ser Leu Ser Gly Asn Lys Arg Arg Ser Val Leu Asn Leu Asp Gly
1025 1030 1035

45 Gln Leu Val Asp Tyr Ser Gln Gly Arg Asn Tyr Thr Ala His Leu
1040 1045 1050

Val Trp Pro Asn Asn Met Arg Glu Gly Asn Glu Ser Lys Leu Thr
1055 1060 1065

50 Leu Ile Gly Thr Ser Gly Arg Ala Pro Arg Ser Ile Ala Phe Ser

| | 1070 | | 1075 | | 1080 |
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| 5 | Gly Pro Trp Ala Gln Phe Arg Leu Phe Gly Ala Gly Gln Leu Thr 1085 1090 1095 | | | | |
| 10 | Asn Val Thr Ser Asp Thr Phe Asn Val Arg Phe Asn Val Asp Gly 1100 1105 1110 | | | | |
| 15 | Gly Ala Met Val Tyr Gln Val His Val Asp Thr Glu Asp Asn Pro 1115 1120 1125 | | | | |
| 20 | Phe Thr Gly Gly Leu Phe Ser Leu Phe Arg Leu Pro Asp Thr Leu 1130 1135 1140 | | | | |
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| 35 | tttaacaaag aaatcgatgc gtccagcccg tatctctaca aagctgtgac caccggacag 240 | | | | |
| 40 | accctgaaaa cggcagaatt taagttttac cgcatacaac atgccgggtca ggaagtggag 300 tacttcaaca tcacgcttga taacgtcaag ctggtcagag tcgctccgct tatgcacgac 360 | | | | |
| 45 | atcaaggatc cttccagaga gaagcataac cacctggaac gtattgagtt ccgctacgag 420 aaaatcacct ggacttacaa agacggcaac atcattcatt ccgactcgtg gaatgagcgt 480 | | | | |
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gatgaccggc 180

gatgcggggt tgtcatcgtt gccgccggaa acctaccgac agccggtagt
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20 tatctgcatg ttcttgatga agaacagctt gtggcgcagg tggagcgatt
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25 catacaccgg 420

gatgtggcgg ttctggccgg acggctgcga cggttcgcc acagtatggc
gacggtgctg 480

cgtcgggagc gcgtaaacgt cccctggctt ctctggagcg ggctgtccgg
30 ctgcgcgttg 540

ccggaagag cgagttcacc gtggtttatc tgtaccggcg gcgaagttca
gtagcaaca 600

35 tccacagaga ccaccatgcc cgcgcagtgg attgcacaat ccggcgtaca
ggagcgcagt 660

cagcgaactct gttacctgct gaaagctgaa agcctgatgc agtggctgaa
40 tcttaatgtg 720

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cgtggggctg 780

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cccgatgac 900

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5 cgccagttat tacggcaggt cgggtgacgat ctgcaccggg tttatgccgt
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gaatttatca ccaaagcccg tcacctgtcg gtgctgaaag acgatgcgac
 catgctcgat 1140

10 ggggtattacc gggaaggaga acccctgcgc ctcggtctgg gggtataccc
 cggcgaacgc 1200

15 atccgccagc cgggtattacg cgccattcgc gactggcgct cgcctgaaca
 aaaaatggag 1260

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 gtttgacgct 1320

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 actgttgacc 180

50 ggcagcttca acggcaaaac ccagtctctg ctagtgatgc ttaatgccga
 agatcagaaa 240

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ctacgatgca 300

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aagtcaggta 360

ctggctgacg tgatgctcag ccaactggccg attagcgcct ggcaaccgca
acttcccaca 420

10 ggctggacgc ttccgcgacaa cggcgacaaa cgcgagctgc gtaacgccag
cggcaaaactg 480

gtcacggaaa tcacctatct gaatcgccag ggaaaacgcg tgccaatcag
15 cattgagcag 540

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582

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tactcaggag 120

caggttaaaa atgccatttt gaaagcagggt gcgcagcgca agtggattat
30 gacgcaagtg 180

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ggttcgtatt 240

35 acatatacag ctacctacta taacatcaaa tatgacagta gcctgaatct
gcaggcttct 300

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agccccggcg 120

gagttaactt cggcacaatc ccgcatagag caggcaagct ctgcacattg
gccagttgtc 180

5 acagctacag gaagtaaact cctttcacaa agtcaccgtt attcctacga
ttatgacact 240

gaagatattt taccgggtat tcgtggtgaa gtgaatatat ttgcttcagg
ggctattgag 300

10 gcggatgtgc gtcggagtga gtcagaagcc gaatattatc attataaaat
ggaagaaaca 360

aaagaggaaa caattcactc ttttgtttca ttatatcttg atgcactcag
15 ggaaaacaa 420

tccattgogg tacttgaaca gagcctttcc cggcataacg caattcttaa
tgacctgaat 480

20 accatcagta ttcatgatac cgggcgggag tctgagcttg ttcaggccga
agccagaagg 540

ttgatggttc ggcagcagat aaattctagg agcagagtac ttaaaccac
gctgggaaaa 600

25 ctgtccactt ggacaaaaaa tccggtaacc gaagctgac ttgaaaatcc
tttttctagg 660

atgacagagg ccaaattatt aactgatttt acacaggctc cacagaaagg
30 taaccgctcg 720

tggcttgcca gccaaagctga tggtgagagt aaaaagcgg cactgaaagc
acaggagctt 780

35 gcccggtacc ctccgggtgga tttaacgggg tctgtaaccc gggatgacca
gcagataggg 840

gtcaatctgt cttgggacct ctttaaccgt aatgccagtt atggtgttac
agaaaagct 900

40 gcgcaaatag tggcagctac cggacgactg gactctgtcg cccgaatgat
tgatgaaacc 960

ggcgattat ctctgataac agtcagacaa agtcgagggg aaatggaaac
45 gctcagacgt 1020

caggaacagg cttcagccag agttgtgga ttttatcgtc ttcagtttca
ggtaggaaga 1080

50 aaaacactga ttgaattact gaatgctgaa aacgaactgt acagtgtcgg
actctccgg 1140

gttcagacgg aggatcagat gctccacggg atgctggatt atctgtattc
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tgatca aacc 120

cggacgatta aagatctgcc gcagccgctg cgatctcagg gtcagatgtt
gatcgc ccgc 180

20 gaccaggggt tattgtggga tcaaacctca ccgttcccca tgcagctatt
gctggatgat 240

aaacgcattg tgcaggtgat caacggtcag ccgccgcaaa tcatcacggc
agaaaa caac 300

25 ccgcagatgt tccagtttaa ccacctgctg cgcgcgctgt tccaggccga
tcgcaa agtg 360

30 ctggaa caaa acttccgcgt cgaatttctg gacaaaggcg aaggccgctg
gacgtgcgc 420

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cgccgggaaa 480

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gctgaataca 120

| | | | | | |
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| | gagaagacga | ctctggatca | agatgttggt | attaacggtg | ataacaagat |
| | tacagccgta | 180 | | | |
| 5 | acaattgaaa | cgtcagattc | agataaagac | cttaatgtta | cttttggcgg |
| | tcacgatatt | 240 | | | |
| | accgccgcat | caacggtaaa | ccaagatttc | gttgaagggtg | taaaagttag |
| | tggtaacaaa | 300 | | | |
| 10 | aatgttggtga | ttaatgctac | agactccacc | atcacagctc | aagggtgaagg |
| | cacctatgtc | 360 | | | |
| | cggactgcaa | tgggtcattga | ttcaactggc | gatgttggtg | ttaatggcgg |
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| 20 | ttaacgctca | atggtacaac | cataaatgct | caaggtaata | agagttacag |
| | caacggctct | 540 | | | |
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| | agttactgcc | 660 | | | |
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| 30 | agtaattggg | 720 | | | |
| | goggctaata | ataaacaac | aatttatgcc | tctgcttcgg | cacaaggcgc |
| | aggttcagca | 780 | | | |
| 35 | acgcaaaatt | taaatttgct | tgttgctgat | tcaaccatct | actctgatgt |
| | cctggccctt | 840 | | | |
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| | tgcccgtctt | 900 | | | |
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| 45 | agatgccagt | 1020 | | | |
| | gtatctctgc | aaaacgggtc | tgtctggaat | gttacgggtt | cctcaactgt |
| | tgatgctctg | 1080 | | | |
| 50 | gcagtaaaag | acagtacggt | taatatcacg | aaggctacag | tcaatactgg |
| | cacgtttgct | 1140 | | | |

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aacggaagg 1320

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gtttattcag 1920

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Caacggcgtg 1980

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45 cgtgggttat 2040

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20 cgtagttcct tcgaagcgcc tatgatggtc agcgttatcg acacttccgc
tcctgaaaat 180

caaactgcta cttcagccac tgatttgctg cgtcattgttc ctggaattac
tcttgatggg 240

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tat caaccg 1260

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aaaaatcagc 120

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ggaaagcccg 180

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ctccatagcc 240

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aggccgtaaa 300

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tgagtctgcg 420

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acaggcaatt 480

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cggtaccgaa 1980

10 acaaatgttc cgggctgggc cactctcaac tttgcagtaa atacagaatt
cggtaacgag 2040

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tgcccgtacg 120

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30 tgagtttacg 180

gacgcgctgg ggctgattac gtccttcagt tatgccaatg ctgaggatga
gcaaaaaacg 240

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cagcgtgatg 300

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caaggggaaa 420

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gcgggcagca 120
10 aaagcagagg ggcaggttaa acagcttcag acacaacaag ccgccgagat
ccgcgaaatt 180

aaaaccgcac agggcaacac gccggtaaac ggtcaatcaa cgacggagtc
15 agagaagaaa 240

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caacgctgat 360

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ttatatctat 660

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cagcaaacaa 720
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tttatataac 780

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aaatggcatc 1020

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cacggcaggg 1080

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30 aaagctgatg 120

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cctgacggcg 180

35 gatggcgaag ccgcgcgggt ggatgtccag ttggttttatc tgagcgacga
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ggggaaaaac 300

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gccgccgatc 360

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45 cgaccaggcc 420

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acaaaatttg 660

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40 Glu Thr Leu Val Val Glu Ala Thr Ala Glu Gln Val Leu Lys Gln
 Gln
 35 40 45

45 Pro Gly Val Ser Val Ile Thr Ser Glu Asp Ile Lys Lys Thr Pro
 Pro
 50 55 60

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 Leu

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|----|--------------------------------------------------------------------|-----|----|-----|--|-----|--|----|
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| 5 | Thr Gly Asn Ser Ala Ser Gly Thr Arg Gly Asn Asn Arg Gln Ile Asp | 85 | | 90 | | 95 | | |
| 10 | Ile Arg Gly Met Gly Pro Glu Asn Thr Leu Ile Leu Ile Asp Gly Val | 100 | | 105 | | 110 | | |
| 15 | Pro Val Thr Ser Arg Asn Ser Val Arg Tyr Ser Trp Arg Gly Glu Arg | 115 | | 120 | | 125 | | |
| 20 | Asp Thr Arg Gly Asp Thr Asn Trp Val Pro Pro Glu Gln Val Glu Arg | 130 | | 135 | | 140 | | |
| 25 | Ile Glu Val Ile Arg Gly Pro Ala Ala Ala Arg Tyr Gly Ser Gly Ala | 145 | | 150 | | 155 | | |
| | | 160 | | | | | | |
| 30 | Ala Gly Gly Val Val Asn Ile Ile Thr Lys Arg Pro Thr Asn Asp Trp | 165 | | 170 | | 175 | | |
| 35 | His Gly Ser Leu Ser Leu Tyr Thr Asn Gln Pro Glu Ser Ser Glu Glu | 180 | | 185 | | 190 | | |
| 40 | Gly Ala Thr Arg Arg Ala Asn Phe Ser Leu Ser Gly Pro Leu Ala Gly | 195 | | 200 | | 205 | | |
| 45 | Asp Ala Leu Thr Thr Arg Leu Tyr Gly Asn Leu Asn Lys Thr Asp Ala | 210 | | 215 | | 220 | | |
| 50 | Asp Ser Trp Asp Ile Asn Ser Pro Val Gly Thr Lys Asn Ala Ala Gly | | | | | | | |

| | | |
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| 225 | 230 | 235 |
| 240 | | |
| 5 His Glu Gly Val Arg Asn Lys Asp Ile Asn Gly Val Val Ser Trp | | |
| Lys | | |
| 245 | 250 | 255 |
| 10 Leu Asn Pro Gln Gln Ile Leu Asp Phe Glu Val Gly Tyr Ser Arg | | |
| Gln | | |
| 260 | 265 | 270 |
| 15 Gly Asn Ile Tyr Ala Gly Asp Thr Gln Asn Ser Ser Ser Ser Ala | | |
| Val | | |
| 275 | 280 | 285 |
| 20 Thr Glu Ser Leu Ala Lys Ser Gly Lys Glu Thr Asn Arg Leu Tyr | | |
| Arg | | |
| 290 | 295 | 300 |
| 25 Gln Asn Tyr Gly Ile Thr His Asn Gly Ile Trp Asp Trp Gly Gln | | |
| Ser | | |
| 305 | 310 | 315 |
| 320 | | |
| 30 Arg Phe Gly Val Tyr Tyr Glu Lys Thr Asn Asn Thr Arg Met Asn | | |
| Glu | | |
| 325 | 330 | 335 |
| 35 Gly Leu Ser Gly Gly Gly Glu Gly Arg Ile Leu Ala Gly Glu Lys | | |
| Phe | | |
| 340 | 345 | 350 |
| 40 Thr Thr Asn Arg Leu Ser Ser Trp Arg Thr Ser Gly Glu Leu Asn | | |
| Ile | | |
| 355 | 360 | 365 |
| 45 Pro Leu Asn Val Met Val Asp Gln Thr Leu Thr Val Gly Ala Glu | | |
| Trp | | |
| 370 | 375 | 380 |

366/370

| | | |
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| | Asn | |
| | 385 | 390 |
| | 400 | 395 |
| 5 | | |
| | Asp Arg Asp Ile Ser Gly Ile Ser Gly Ser Ala Ala Asp Arg Ser | |
| | Ser | |
| | 405 | 410 |
| 10 | | 415 |
| | Lys Asn His Ser Gln Ile Ser Ala Leu Tyr Ile Glu Asp Asn Ile | |
| | Glu | |
| | 420 | 425 |
| 15 | | 430 |
| | Pro Val Pro Gly Thr Asn Ile Ile Pro Gly Leu Arg Phe Asp Tyr | |
| | Leu | |
| | 435 | 440 |
| 20 | | 445 |
| | Ser Asp Ser Gly Gly Asn Phe Ser Pro Ser Leu Asn Leu Ser Gln | |
| | Glu | |
| | 450 | 455 |
| 25 | | 460 |
| | Leu Gly Asp Tyr Phe Lys Val Lys Ala Gly Val Ala Arg Thr Phe | |
| | Lys | |
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| 30 | | 475 |
| | 480 | |
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| | Lys | |
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| | Gly Asn Gly Cys Pro Lys Asp Ile Thr Ser Gly Gly Cys Tyr Leu | |
| | Ile | |
| 40 | | 500 |
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| | | 510 |
| | Gly Asn Lys Asp Leu Asp Pro Glu Ile Ser Val Asn Lys Glu Ile | |
| | Gly | |
| 45 | | 515 |
| | | 520 |
| | | 525 |
| | Leu Glu Phe Thr Trp Glu Asp Tyr His Ala Ser Val Thr Tyr Phe | |
| | Arg | |
| 50 | | 530 |
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| | | 540 |

| | | |
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| | Gln | |
| | 545 | 550 555 |
| 5 | 560 | |
| | Thr Ala Ser Gly Ala Tyr Ile Leu Lys Trp Gln Asn Gly Gly Lys | |
| | Ala | |
| 10 | | 565 570 575 |
| | Leu Val Asp Gly Ile Glu Ala Ser Met Ser Phe Pro Leu Val Lys | |
| | Glu | |
| 15 | | 580 585 590 |
| | Arg Leu Asn Trp Asn Thr Asn Ala Thr Trp Met Ile Thr Ser Glu | |
| | Gln | |
| 20 | | 595 600 605 |
| | Lys Asp Thr Gly Asn Pro Leu Ser Val Ile Pro Lys Tyr Thr Ile | |
| | Asn | |
| 25 | | 610 615 620 |
| | Asn Ser Leu Asn Trp Thr Ile Thr Gln Ala Phe Ser Ala Ser Phe | |
| | Asn | |
| 30 | | 625 630 635 |
| | 640 | |
| | Trp Thr Leu Tyr Gly Arg Gln Lys Pro Arg Thr His Ala Glu Thr | |
| | Arg | |
| 35 | | 645 650 655 |
| | Ser Glu Asp Thr Gly Gly Leu Ser Gly Lys Glu Leu Gly Ala Tyr | |
| | Ser | |
| 40 | | 660 665 670 |
| | Leu Val Gly Thr Asn Phe Asn Tyr Asp Ile Asn Lys Asn Leu Arg | |
| | Leu | |
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